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# **A SELECTED BIBLIOGRAPHY ON IRRIGATION MANAGEMENT**

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**IIMI**

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# PREFACE

The Bibliography compiled by the IIMI Headquarters Documentation Service is a computer-generated listing of citations on irrigation management and related disciplines selected from the Irrigation Management Information Network database.

This annual volume supplements the earlier volumes and contains citations added during 1994. The bibliography is not exhaustive in its coverage of literature on irrigation management, but many significant writings across a spectrum of disciplines that address irrigation management are included.

Citations are arranged according to broad Dewey Decimal Classification divisions. Aspects of irrigation management have been expanded by IIMI to better distinguish them as otherwise the majority of documents would fall within a single category. Arrangement of entries is by alphabetical order of author and title within each category. Abstracts are included only where feasible.

Specific keyword and geographical terms are assigned, in addition to the categorical divisions, thus bringing together citations on more specific topics regardless of the category in which they are located in the main body of the bibliography. Author and title indexes are included

facilitating access to individual citations. Entries are added to the database as and when documents are acquired by the collaborating institutions and therefore old as well as new documents are included in a particular period. All documents cited are housed in the collaborating institutes indicated by the location codes.

Requests for literature searches, compilation of bibliographic information from the database and photocopying services may be addressed to the IIMI Headquarters Documentation Service. IIMI will provide photocopies of non-restricted and non-copyright materials available at Headquarters, or help obtain documents through inter-library loan.

In compiling the bibliography I have been assisted by a number of people at IIMI Headquarters and at our collaborating institutes. I would like to thank them for their support in preparing records for inclusion in the database and their willingness to follow the strict standards set for this cooperative venture.

Ramya de Silva  
*Library and Documentation Service*

July 24, 1995





# GUIDE TO ENTRIES

			Authors
			Date
Entry Number	13775.	Al-Azba, A.; Strelkoff, T.	1994.
Title	Correct form of		
	hall technique for border irrigation advance.		
Journal Title	Journal of		
	Irrigation and Drainage Engineering,	120(2):292-307.	Collation
Keywords	Border irrigation / Mathematical models / Computer techniques / Infiltration		
Location	(Location: HQ Call No: PER Record No: H 14096)		
Abstract	<p><b>Abstract:</b> The Hall technique for computing stream advance down an irrigated border strip is shown to be inconsistent in the selection of numerical parameters for approximating infiltrated volume. This inconsistency leads to violation of mass conservation and to error in computed advance. By viewing it in dimensionless terms, the behavior of this error is demonstrated over the practical range of variation of border-irrigation parameters with a K ostiakov infiltration formula and Manning roughness formula. It is shown to vary from insignificant magnitudes under 1% to well over 10%. A correction term to neutralize the inconsistency is presented. An lternate formulation free of the inconsistency and suitable for modern high-speed computers working with a reasonably large number of significant figures is presented. Errors stemming from the basic physical assumption - constant average depth of surface water - are not addressed.</p>		

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## ABBREVIATIONS USED

ACIAR	Australian Council of International Agricultural Research
ADB	Asian Development Bank
BIDS	Bangladesh Institute of Development Studies
CEA	Central Environmental Authority (Sri Lanka)
CGIAR	Consultative Group on International Agricultural Research
CIHEAM	Instituto Agronomico Mediterraneo Valenzano - Bari
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
DERAP	Development and Action Research Programme, Michelsen Institute (Norway)
FAO	Food and Agriculture Organization
GIS	Geographical Information Systems
IAHS	International Association of Hydrological Sciences
ICAR	Indian Council of Agricultural Research
ICID	International Commission on Irrigation and Drainage
IDS	Institute of Development Studies (UK)
IFAR	International Fund for Agricultural Research
IFPRI	International Food Policy Research Institute
IHP	International Hydrological Programme
IIED	International Institute for Environment and Development
IIMI	International Irrigation Management Institute
ILRI	International Livestock Research Institute
ISNAR	International Service for National Agricultural Research
ISPAN	Irrigation Support Project for Asia and the Near East
IUFRO	International Union of Forestry Research Organizations
IWASRI	International Waterlogging and Salinity Research Institute
JICA	Japan International Cooperation Agency
MANCID	Malaysian National Committee on Irrigation and Drainage
MENA	Middle East and North Africa
NARS	National Agricultural Research Systems
ODI	Overseas Development Institute (UK)
RAPA	Regional Office for Asia and the Pacific (FAO, Bangkok)
UNESCO	United Nations Educational Scientific and Cultural Organization
USAID	United States Agency for International Development
WALMI	Water and Land Management Institute
WARDA	West Africa Rice Development Association
WASH	Water and Sanitation for Health Project

### LOCATION CODES:

HQ	IIMI, Headquarters, Sri Lanka
ICID	International Commission on Irrigation and Drainage, Head Office, New Delhi, India
ODI	Overseas Development Institute, UK

## GENERALITIES

## Computer software

12990. **Smith, M. 1993.** CLIMWAT for CROPWAT: A climatic database for irrigation planning and management. Rome, Italy FAO. iii, 113p. + 5 (3 1/2") diskettes. (FAO irrigation and drainage paper 49)

*Computer software / Databases / Agroclimatology / Irrigation scheduling / Irrigation management / Crop-based irrigation / Evapotranspiration / Rain*  
(Location: HQ Call No: R 001.6425 G000 SMI Record No: H 14123)

## Special computer methods

12991. **Barrett, C.B. 1993.** The development of the Nile hydrometeorological forecast system. Water Resources Bulletin, 29(6):933-938.

*GIS / Forecasting / Simulation / Rivers / Precipitation / Satellite surveys / Egypt / Cairo / Nile River*  
(Location: HQ Call No: PER Record No: H 14506)

12992. **Eash, D.A. 1994.** A geographic information system procedure to quantify drainage-basin characteristics. Water Resources Bulletin, 30(1):1-8.

*GIS / Catchment areas / Geomorphology / USA / Iowa*  
(Location: HQ Call No: PER Record No: H 14275)

12993. **Green, D.R. 1993.** Map output from geographic information and digital image processing systems: A cartographic problem. The Cartographic Journal, 30:9196.

*GIS / Mapping / Remote sensing*  
(Location: HQ Call No: P 3438 Record No: H 14567)

12994. **Griner, A.J. 1993.** Development of a water supply protection model in a GIS. Water Resources Bulletin, 29(6):965-971.

*Water supply / GIS / Groundwater management / Surface water / Wells / Aquifers / Mapping / Hydrology / Models / Computer techniques / USA / Florida*  
(Location: HQ Call No: PER Record No: H 14509)

12995. **He, C.; Riggs, J.F.; Kang, Y.T. 1993.** Integration of geographic information systems and a computer model to evaluate impacts of agricultural runoff on water quality. Water Resources Bulletin, 29(6):891-900.

*GIS / Water quality / Computer models / Runoff / Watersheds / USA / Michigan*  
(Location: HQ Call No: PER Record No: H 14501)

12996. **Hinaman, K.C. 1993.** Use of a Geographic Information System to assemble input-data sets for a finite-dif-

ference model of ground-water flow. Water Resources Bulletin, 29(3):401-405.

*GIS / Groundwater / Computer models / USA / Maryland / Piedmont*  
(Location: HQ Call No: PER Record No: H 13765)

12997. **Hudak, P.F.; Loaiciga, H.A.; Schoolmaster, F.A. 1993.** Application of Geographic Information Systems to groundwater monitoring network design. Water Resources Bulletin, 29(3):383-390.

*Groundwater / GIS / Water pollution / Water quality / Monitoring / Networks / Simulation models*  
(Location: HQ Call No: PER Record No: H 13764)

12998. **ISPAN. 1993.** ISPAN brings GIS technology to Bangladesh's flood action plan. Water, 3:3-6.

*GIS / Flood control / Information systems / Bangladesh*  
(Location: HQ Call No: P 3397 Record No: H 14242)

12999. **Jankowski, P.; Richard, L. 1994.** Integration of GIS-based suitability analysis and multicriteria evaluation in a spatial decision support system for route selection. Environment and Planning B: Planning and Design, 21:323-340.

*GIS / Decision support tools / Decision making / Land use / Mapping / Computer techniques / USA / Washington / King County*  
(Location: HQ Call No: P 3575 Record No: H 15167)

13000. **Jayasekera, A.A.; Walker, W.R. 1992.** Remotely sensed data and geographic information systems: For management and appraisal of large scale irrigation projects in the developing countries. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992, Leuven, Belgium: Center for Irrigation Engineering. pp.453-461.

*GIS / Irrigation management / Large-scale systems / Land use / Remote sensing / Irrigation programs / Rice / Productivity / Water availability / Cropping systems / Developing countries / Sri Lanka / Gal Oya Project*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14426)

13001. **Jeton, A.E.; LaRue Smith, J. 1993.** Development of watershed models for two Sierra Nevada basins using a geographic information system. Water Resources Bulletin, 29(6):923-932.

*GIS / Watersheds / Computer models / USA / Nevada / California*

(Location: HQ Call No: PER Record No: H 14505)

13002. Juracek, K.E.; Kenny, J.F. 1993. Management and analysis of water-use data using a geographic information system. *Water Resources Bulletin*, 29(6):973-979.

*GIS / Water use / Information systems / Databases / Water management / Irrigation water / Water supply / USA / Kansas*

(Location: HQ Call No: PER Record No: H 14510)

13003. Kalkhoff, S.J. 1993. Using a geographic information system to determine the relation between stream quality and geology in the Roberts Creek watershed, Clayton County, Iowa. *Water Resources Bulletin*, 29(6):989-996.

*GIS / Water quality / Geology / Watersheds / USA / Iowa / Clayton County*

(Location: HQ Call No: PER Record No: H 14512)

13004. Kucera, K.P. 1993. Data acquisition, storage and retrieval. In Zakaria, S. (Ed.), *Agricultural drainage: Proceedings of the National Conference on Agricultural Drainage*, Melaka, Malaysia, 9-12 February 1993. Melaka, Malaysia: MANCID. pp.5.29-5.57.

*GIS / Data collection / Remote sensing / Malaysia / Sarawak*

(Location: HQ Call No: 631.62 G714 ZAK Record No: H 14720)

13005. Leipnik, M.R.; Kemp, K.K.; Loaiciga, H.A. 1994. Implementation of GIS for water resources planning and management. *Water Resources Journal*, March:1-13.

*Water resource management / Planning / Maps / GIS*

(Location: ODI Record No: L 942939)

13006. Leung, Y.; Leung, K.S. 1993. An intelligent expert system shell for knowledge-based geographical information systems: 2. Some applications. *International Journal of Geographical Information Systems*, 7(3):201-213.

*GIS / Computer techniques / Information systems / Land classification / Climate*

(Location: HQ Call No: P 3266 Record No: H 13744)

13007. Leung, Y.; Leung, K.S. 1993. An intelligent expert system shell for knowledge-based geographical information systems: 1. The tools. *International Journal of Geographical Information Systems*, 7(3):189-199.

*GIS / Computer techniques / Information systems*

(Location: HQ Call No: P 3265 Record No: H 13743)

13008. Linsey, T.K.; Raper, J.F. 1993. HyperArc: A task-oriented hypertext GIS interface. *International Journal of Geographical Information Systems*, 7(5):435-452.

*GIS / Computer techniques / Computer software*

(Location: HQ Call No: P 3378 Record No: H 14194)

13009. Morgan, G.; Nyborg, P. 1994? Using geographic information systems to support watershed management: Case studies from Nepal and China. Washington, DC, USA World Bank. ii, 20p. (ITLAB technical paper GIS series no.1)

*GIS / Watershed management / Land use / Environmental effects / Decision making / Case studies / Nepal / China*

(Location: HQ Call No: P 3483 Record No: H 14623)

13010. Nevo, A.; Oad, R.; Podmore, T.H. 1994. An integrated expert system for optimal crop planning. *Agricultural Systems*, 45(1):73-92.

*Computer techniques / Cropping systems / Agricultural production*

(Location: HQ Call No: PER Record No: H 12023)

13011. Rehman, G.; Vander Velde, E.J. 1993. Remote sensing applications for irrigation management in Asia. Paper presented at the Workshop on the Use of Remote Sensing Techniques in Irrigation and Drainage, Montpellier, France, 2-5 November 1993. 10p.

*Remote sensing / Irrigation management / Sustainability / Water use efficiency / Land development / Asia*

(Location: HQ Call No: IIMI 006 G570 REH Record No: H 6053)

13012. Richards, C.; Host, G. 1994. Examining land use influences on stream habitats and macroinvertebrates: A GIS approach. *Water Resources Bulletin*, 30(4):729-738.

*Land use / GIS / Watershed management / Ecology / USA*

(Location: HQ Call No: PER Record No: H 15678)

13013. Richards, C.J.; Roaza, H.; Roaza, R.M. 1993. Integrating geographic information systems and MODFLOW for ground water resource assessments. *Water Resources Bulletin*, 29(5):847-853.

*Groundwater management / Aquifers / GIS / Simulation models / Calibrations / USA / Florida*

(Location: HQ Call No: PER Record No: H 14072)

**Abstract:** The Floridan Aquifer is the primary source of water in the coastal area of Santa Rosa Country, Florida. In order to optimize well field design and analyze aquifer stress problems, the USGS MODFLOW code (McDonald and Harbaugh, 1988) is applied to develop a numerical computer model of the aquifer. The Geographical Information System (GIS) is the primary tool used in the development of the model grid, performance of the modeling procedure, and model analysis.

The GIS is used in generating multiple grids in which to simulate both regional scale and local scale flow. The grid topology is recorded in geographic coordinates which facilitates georeferencing and orientation of the grid to base maps and data coverages. The GIS allows data transfer from various coverages to the nodes of the block centered grid where hydrogeologic information is stored as attributes to the grid coverage. From this grid coverage, pertinent information is queried within the GIS environment and used to generate the input files for the MODFLOW simulation. The MODFLOW execution, simulated heads and drawdown are imported into the grid coverage where residual error and recharge rates can be calculated. Contoured surfaces are then created for selected data sets including simulated heads, drawdown, residual error, and recharge rates. Model calibration is conducted utilizing the GIS to generate the process data sets associated with model simulations.

13014. **Robinson, K.J.; Ragan, R.M. 1993.** Geographic information system based nonpoint pollution modeling. *Water Resources Bulletin*, 29(6):1003-1008.

*GIS / Pollution / Models / Simulation / Remote sensing / Legislation / USA*

(Location: HQ Call No: PER Record No: H 14514)

13015. **Tachikawa, Y.; Shiiba, M.; Takasao, T. 1994.** Development of a Basin Geomorphic Information System using a TIN-DEM data structure. *Water Resources Bulletin*, 30(1):9-17.

*GIS / Models / Geomorphology / Rainfall-runoff relationships / River basins / Drainage / Catchment areas*

(Location: HQ Call No: PER Record No: H 14276)

13016. **Treitz, P.; Elliot, L.; Howarth, P. 1993.** Differential global positioning system Potential for geographical information system database management. *Environment and Planning*, 25:883-898.

*GIS / Information systems / Databases / Mapping*

(Location: HQ Call No: P 3309 Record No: H 13953)

13017. **Warwick, J.J.; Haness, S.J. 1994.** Efficacy of ARC/INFO GIS application to hydrologic modeling. *Journal of Water Resources Planning and Management*, 120(3):366-381.

*GIS / Hydrology / Simulation models / Runoff / Watersheds / USA*

(Location: HQ Call No: PER Record No: H 14286)

13018. **Westmoreland, S.; Stow, D.A. 1992.** Category identification of changed land-use polygons in an inte-

grated image processing/geographic information system. *Photogrammetric Engineering and Remote Sensing*, 58(11):1593-1599.

*GIS / Land use / Computer techniques / USA*

(Location: HQ Call No: P 3486 Record No: H 14626)

13019. **Wopereis, M.C.S.; Kropff, M.J.; Bouma, J. 1994.** Soil data needs for regional studies of yield constraints in water-limited environments using modeling and GIS. In Wopereis, M.; Kropff, M.; Bouma, J.; van Wijk, A.; Woodhead, T. (Eds.) *Soil physical properties: Measurement and use in rice-based cropping systems*. Los Banos, Laguna, Philippines: IRRI. pp.87-101.

*GIS / Simulation models / Soils / Rice / Paddy fields*

(Location: HQ Call No: 631.4 G000 WOP Record No: H 14543)

### Information sources

13020. **Zelt, R.B.; Dugan, J.T. 1993.** Simulation and mapping of soil-water conditions in the great plains. *Water Resources Bulletin*, 29(6):939-948.

*Simulation / Infiltration / Soil water / GIS / Irrigation requirements / USA*

(Location: HQ Call No: PER Record No: H 14507)

13021. **Campbell, D.B. 1994.** Providing information services in water, sanitation and health. *Information Development*, 10(2):124-130.

*Sanitation / Information services / Networking / USA*

(Location: ODI Call No: ODI Journals Record No: L 942422)

13022. **de Jong, D. 1994.** Focus on...IRC International Water and Sanitation Centre. *Information Development*, 10(2):144-148.

*Sanitation / Information management / Information services*

(Location: ODI Call No: ODI Journals Record No: L 942425)

13023. **Heijnen, H. 1994.** Information in the water and sanitation sector. *Information Development*, 10(2):61-64.

*Sanitation / Information services / Water management*

(Location: ODI Call No: ODI Journals Record No: L 942414)

13024. **Iddings, S.N. 1994.** Information management for water and sanitation in Papua New Guinea. *Information Development*, 10(2):110-113.

*Sanitation / Information services / Water / Papua New Guinea*

(Location: ODI Call No: ODI Journals Record No: L 942420)

# SOCIAL SCIENCES

## Communication

13025. **Byerley, G.P. 1994.** Keeping water professionals informed. The role of the American Water Works Association. *Information Development*, 10(2):120-123.

*Information services / Networking / Water / USA*  
(Location: ODI Call No: ODI Journals Record No: L 942421)

13026. **Ramos, L.O.; Gregorio, J. 1994.** Village-level information and communication for water supply and sanitation: The approtech Asia experience. *Information Development*, 10(2):88-92.

*Water supply / Sanitation / Information / Community participation / Planning / Sri Lanka / Kondatenna*  
(Location: ODI Call No: ODI Journals Record No: L 942417)

13027. **Riunge, T.W. 1994.** Improving information management for water and sanitation in East Africa: The role of NETWAS. *Information Development*, 10(2):137-43.

*Sanitation / Information systems / East Africa*  
(Location: ODI Call No: ODI Journals Record No: L 942424)

## Women

13028. **á Nijeholt, G.L. 1992.** Women and the meaning of development: Approaches and consequences. Brighton, UK: IDS. 26p. (IDS silver jubilee paper 7)

*Women in development / Development policy / Poverty / Equity / Employment*  
(Location: HQ Call No: 305.4 G000 ANI Record No: H 15153)

13029. **Assaad, M.; el Katsha, S.; Watts, S. 1994.** Involving women in water and sanitation initiatives: An action/research project in an Egyptian village. *Water International*, 19(3):113-120.

*Public health / Sanitation / Rural women / Woman's status / Women in development / Social participation / Villages / Egypt / Nile River*  
(Location: HQ Call No: PER Record No: H 15494)

13030. **Backer, S. 1992.** Women in development (WID) study for the Nepal SPWP. Part of a study titled "Promotional action to incorporate the gender dimension into selected mainstream projects in South Asia". (RAS/90/MO2/NOR), Nepal, 8 January - 25 February 1992. iv, 60p. + annexes.

*Women in development / Gender differences / Nepal*  
(Location: HQ Call No: P 3474 Record No: H 14612)

13031. **Berger, M. 1989.** Giving women credit: The strengths and limitations of credit as a tool for alleviating poverty. *World Development*, 17(7):1017-1032.

*Women in development / Woman's status / Poverty / Credit policy / Developing countries / Financial institutions / Non-governmental organizations*  
(Location: HQ Call No: P 3635 Record No: H 12647)

13032. **Cecelski, E.W. 1991.** Practical strategies and approaches to addressing gender issues at planning stages in the energy and water sectors: Lessons from international experience. Paper presented at the Seminar/Training Workshop on Women in Water and Energy Development in Nepal, Water and Energy Commission Secretariat (WECS), Institutional Strengthening Project (WISP), Kathmandu, Nepal, 17-22 November 1991. v, 65p.

*Women in development / Gender relations / Water management / Project planning / Energy / Training*  
(Location: HQ Call No: P 3475 Record No: H 14613)

13033. **Joekes, S.; Heyzer, N.; Oniang'o, R.; Salles, V. 1994.** Gender, environment and population. *Development and Change*, 25(1):137-165.

*Forestry / Shifting cultivation / Land ownership / Drought / Deforestation / Agriculture / Water supply / Pollution / Poverty / Division of labor / Women's rights / Malaysia / Kenya / Mexico / Sarawak / Embu / Xochimilco*  
(Location: ODI Call No: ODI Journals Record No: L 940544)

13034. **Jordan, S.; Wagner, F. 1993.** Meeting women's needs and priorities for water and sanitation in cities. *Environment and Urbanization*, 5(2):135-145.

*Urbanization / Water / Health / Women / Diseases*  
(Location: ODI Call No: ODI Journals Record No: L 940530)

13035. **Massiah, J. (Ed.) 1993.** Women in developing economies: Making visible the invisible. Providence, RI, USA: Berg Publishers. 300p.

*Women in development / Developing countries / Economic development / Tunisia / Ghana / Colombia / Caribbean*  
(Location: HQ Call No: 305.4 G000 MAS Record No: H 14680)

13036. **Parasuraman, S. 1993.** Impact of displacement by development projects on women in India. The Hague, Netherlands: Institute of Social Studies. 23p. (Institute of Social Studies working paper no.159)

*Project management / Settlement / Employment / Water pollution / Irrigation / India*  
(Location: ODI Call No: R-ISS WP 159 Record No: L 941295)

13037. **Ranadive, J.R. 1994.** Gender implications of adjustment policy programme in India: Significance of the

household. Economic and Political Weekly, April 30:WS12-WS18.

*Gender relations / Households / Women / Economic policy / India*

(Location: HQ Call No: P 3499 Record No: H 14644)

#### Rural sociology

13038. Mondal, A.H.; Asaduzzaman, M. 1993. Maintenance of rural infrastructure at the local level: Experiences with the defunct Upazila system in Bangladesh. Dhaka, Bangladesh: Bangladesh Institute of Development Studies. 107p. (BIDS research report no.134)

*Marketing / Irrigation systems / Rural development / Education / Management / Maintenance / Engineering / Human resources / Costs / Finance / Bangladesh*

(Location: ODI Call No: R-BIDS RR 134 Record No: L 942207)

13039. Roth, D. 1994. How 'integrated' is integrated rural development? The case of the Pompengan Integrated Area Development Project (PIADP), Luwu District, South Sulawesi, Indonesia. Public Administration and Development, 14(4):377-393.

*Rural development / Poverty / Project management / Irrigation / Land reform / Settlement patterns / Farmers / Indonesia / South Sulawesi / Luwu*

(Location: ODI Call No: ODI Journals Record No: L 942631)

#### Economic situation and conditions

13040. Austin, V. 1984. Rural project management. A handbook for students and practitioners. London, UK: Batsford Academic and Educational Ltd. xv, 280p.

*Rural development / Project management / Project planning / Project design / Project control / Personnel management / Maintenance / Marketing / Financial planning / Monitoring / Evaluation*

(Location: HQ Call No: 330.9 G000 AUS Record No: H 14033)

13041. India. Ministry of Finance. Economic Division. 1993. Economic survey 1992-1993. New Delhi, India: The Controller of Publications. xvi, 218p. + annexes.

*Economic situation / Economic evaluation / Agricultural production / Industrialization / Infrastructure / Social aspects / Statistics / Public finance / Monetary reform / Prices / Water supply / Sanitation / Labor / India*

(Location: HQ Call No: 330.9 G635 IND Record No: H 13719)

#### Land economics

13042. Biswas, A.K. 1993. Land resources for sustainable agricultural development in Egypt. Ambio, 22(8):556-560.

*Land resources / Sustainable agriculture / Land reclamation / Land management / Egypt*

(Location: HQ Call No: P 3331 Record No: H 13321)

13043. Cammaer, R.; Phiri, G.S.; Osunsanya, A.B. 1993. Development of Conservation Measures and Messages Project: Southern and Central Region - Malawi. Si-phon, 15:25-26.

*Land development / Soil conservation / Farmer participation / Malawi*

(Location: HQ Call No: P 2996 Record No: H 13723)

13044. Harbor, J.M. 1994. A practical method for estimating the impact of land-use change on surface runoff, groundwater recharge and wetland hydrology. Journal of the American Planning Association, 60(1):95-108.

*Land use / Surface runoff / Groundwater / Wetlands / Hydrology / Models / Planning / USA*

(Location: HQ Call No: P 3478 Record No: H 14616)

13045. Sharifi, M.A.; Van Keulen, H. 1994. A decision support system for land use planning at farm enterprise level. Agricultural Systems, 45(3):239-257.

*Land use / GIS / Simulation models / Decision making / Agricultural planning*

(Location: HQ Call No: PER Record No: H 14273)

13046. Smyth, A.J.; Dumanski, J.; Spendjian, G.; Swift, M.J.; Thornton, P.K. 1993. FESLM: An international framework for evaluating sustainable land management - A discussion paper. Rome, Italy: FAO. vii, 74p. (World soil resources reports 73)

*Land management / Sustainability / Land use / Evaluation*

(Location: HQ Call No: 333 G000 SMY Record No: H 14833)

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*Land use / Land management / Land improvement / Land development / Soil conservation / Policy / Planning*

(Location: HQ Call No: 333 G000 SOI Record No: H 14035)

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*Land use / Planning / Evaluation*

(Location: HQ Call No: PER Record No: H 13874)

13049. **Wilson, L. 1983.** A land-use policy based on water supply. *Water Resources Bulletin*, 19(6):937-942.

*Land use / Water policy / Water supply / Water conservation / Water management / Political aspects / Recharge / USA / New Mexico / Santa Fe County*

(Location: HQ Call No: P 3598 Record No: H 15286)

**Public ownership of land and natural resources**

13050. **Chadha, G.K. 1994.** On the concept and reality of the landless in rural India. *Indian Journal of Agricultural Economics*, 49(3):352-359.

*Land ownership / Landlessness / Rural sociology / Households / Agricultural manpower / India*

(Location: HQ Call No: PER Record No: H 15517)

13051. **Kushwaha, R.K.S.; Maurya, O.P. 1994.** Impact of changes in land ownership on agricultural production relations in the context of new agricultural technology. *Indian Journal of Agricultural Economics*, 49(3):346-351.

*Land ownership / Agricultural production / Sociological analysis / Statistics / India*

(Location: HQ Call No: PER Record No: H 15516)

13052. **Ostrom, E. 1994.** Neither market nor state: Governance of common-pool resources in the twenty-first century. Washington, DC, USA: IFPRI. 33p. (IFPRI lecture series)

*Natural resources / Public ownership / Private ownership / Farmer managed irrigation systems / Farmer-agency interactions / Nepal*

(Location: HQ Call No: P 3611 Record No: H 15309)

Note: Lecture presented on 2 June 1994 at IFPRI, Washington, DC, USA.

**Ownership and control of land and natural resources by nongovernmental collectivities**

13053. **Civici, A.; Kërçini, D; Griffin, M. 1994.** A nation of postage stamps: Has privatization of Albania's collectives created 400,000 unviable farms? *Ceres*, 26(2):40-42.

*Privatization / Farming systems / Land reform / Economic policy / Albania*

(Location: HQ Call No: P 3505 Record No: H 14661)

13054. **Davis, C.G. 1993.** Sustainable development, poverty reduction, and agricultural sector privatization in the developing world: Whether the complementarity? Working paper, Food and Resource Economics Department, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida, USA. 20p. (International working paper series IW93-2)

*Privatization / Sustainable agriculture / Poverty / Developing countries / Economic growth*

(Location: HQ Call No: P 3555 Record No: H 14829)

13055. **Glynn, D.; Baker, B.; Jones, C.; Liesner, J. 1991.** Major economic issues in privatization and regulation. Background discussion paper presented to the World Bank Conference on Water Industry Privatization, London, 28 January - 1 February 1991. 20p.

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(Location: HQ Call No: P 3000 Record No: H 13727)

13056. **Katz, B.G.; Owen, J. 1993.** Privatization: Choosing the optimal time path. *Journal of Comparative Economics*, 17:715-736.

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13057. **Kelegama, S. 1993.** Privatization in Sri Lanka: The experience during the early years of implementation. Colombo, Sri Lanka: Sri Lanka Economic Association. 1 microfiche; 70p.

*Privatization / Economic policy / Private sector / Public sector / Sri Lanka*

(Location: HQ Call No: F 102 Record No: H 15195)

13058. **O'Looney, J. 1993.** Beyond privatization and service integration: Organizational models for service delivery. *Social Service Review*, December:501-534.

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(Location: HQ Call No: P 3400 Record No: H 14245)

13059. **Perotti, E.C.; Guney, S.E. 1993.** The structure of privatization plans. *Financial Management*, Spring:84-98.

*Privatization / Economic policy*

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13060. **Prager, J. 1992.** Is privatization a panacea for LDCs? Market failure versus public sector failure. *The Journal of Developing Areas*, 26:301-321.

*Privatization / Developing countries / Economic policy / Marketing policy / Public sector / Public ownership*

(Location: HQ Call No: P 3508 Record No: H 14664)

13061. **Rodriguez, F. 1992.** The Mexican privatization programme: An economic analysis. *Social and Economic Studies*, 41(4):149-171.

*Privatization / Public sector / Economic analysis / Economic policy / Private sector / Mexico*

(Location: HQ Call No: P 3384 Record No: H 14200)



13062. **Roland, G.; Verdier, T. 1994.** Privatization in Eastern Europe: Irreversibility and critical mass effects. *Journal of Public Economics*, 54:161-183.

*Privatization / Development policy / Economic policy / Mathematical models / Eastern Europe*

(Location: HQ Call No: P 3605 Record No: H 3292)

13063. **Savas, E.S. 1987.** Privatization: The key to better government. Chatham, NJ, USA: Chatham House Publishers. xii, 308p. (Chatham House series on change in American politics)

*Privatization / Public goods / Economic policy / Government / USA*

(Location: HQ Call No: 333.2 G430 SAV Record No: H 13552)

13064. **Wortman, M. 1992.** Africa private sector development: Special evaluation. Labat-Anderson Inc. 1 microfiche; 50p.

*Private sector / Investment / Development aid / Economic policy / Africa*

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#### **Private ownership of land and natural resources**

13065. **Park, T.K. 1993.** Privatization and development: The case of the Dirol Plain. In Park, T.K.(Ed.), Risk and tenure in arid lands: The political ecology of development in the Senegal River Basin. Tucson, AZ, USA: University of Arizona Press. pp.224-254.

*Privatization / Development policy / Case studies / Political aspects / Villages / Land tenure / Mauritania / Dirol Plain*

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13066. **Whittemore, C. 1981.** Land for people: Land tenure and the very poor. Oxford, UK: Oxfam. 55p.

*Land tenure / Poverty / Aid / Land ownership / Rural development / Policy*

(Location: HQ Call No: 333.3 G000 WHI Record No: H 14092)

#### **Natural resources and energy**

13067. **Chalise, S.R.; Bhatta, B.R.; Shengji, P.; Shah, P.B.; Gurung, J.D. 1993.** Natural resource management in a mountain environment. ICIMOD 10th Anniversary Symposium on Mountain Environment and Development Constraints and Opportunities, 12 December 1993. ii, 77p.

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*/Afghanistan / Bhutan / Bangladesh / Myanmar / China*

(Location: HQ Call No: P 2992 Record No: H 13717)

13068. **Dove, M.R.; Carpenter, C. (Eds.) 1992.** Sociology of natural resources in Pakistan and adjoining countries. Lahore, Pakistan: Vanguard Books. iii, 458p.

*Natural resources / Rural sociology / Agricultural development / Traditional farming / Drought / Farmers' attitudes / Water management / Social aspects / Privatization / Energy / Rural women / Pakistan / Bangladesh / India*

(Location: HQ Call No: 333.7 G730 DOV Record No: H 14106)

13069. **Franks, T.; King, H.; Low, A.; MacArthur, J.D. 1994.** Sustainable management of natural resources: A symposium. Bradford, UK: University of Bradford. Development and Project Planning Centre. 25p. (Development and Project Planning Centre new series discussion papers no.45)

*Management / Natural resources / Sustainability / Non-governmental organizations / Rural development / Water / Fisheries / Common property / Biotechnology / Agricultural research / Productivity / Conservation / Bangladesh*

(Location: ODI Call No: R-Bradford DP 45 Record No: L 941555)

13070. **Ostrom, E. 1994.** Covenants, collective action, and common-pool resources. Workshop in Political Theory and Policy Analysis, Indiana University, Indiana, USA. 25p.

*Common property / Collective action / Public ownership / Natural resources / Design criteria / Institutions*

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13071. **Ostrom, E.; Huckfeldt, S.K.; Schweik, C.M.; Wertime, M.B. 1993.** A relational archive for natural resources governance and management. Paper prepared for presentation at the Conference on Application of Advanced Information Technologies for the Management of Natural Resources, Spokane, Washington, DC, USA, 17-19 June 1993, and the International Workshop on Developing Large Environmental Databases for Sustainable Development, IUFRO, Nairobi, August 1993. 27p.

*Natural resources / Databases / Research / Forestry / GIS*

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*Privatization / Watershed management / Tank irrigation / Policy / India / Gujarat / West Bengal*  
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13073. **Tamang, D.; Gill, G.J.; Thapa, G.B. (Eds.) 1993.** Indigenous management of natural resources in Nepal. Kathmandu, Nepal: HMG Ministry of Agriculture; Winrock International. xi, 375p.

*Natural resources / Agricultural development / Traditional farming / Crop production / Farm management / Vegetables / Pest control / Technology / Livestock / Soils / Agroforestry / Mountains / Irrigation management / Farmer managed irrigation systems / Water resource management / Nepal*  
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13074. **World Resources Institute; UNEP; UNDP. 1994.** World resources 1994-95. New York, NY, USA: Oxford University Press. xii, 400p.

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(Location: ICID Record No: 26007)

13077. **Roth, D. 1993.** A development project and its sociocultural environment: Land reform and settlement in the Pompengan Integrated Area Development Project (PIADP), Luwu, South Sulawesi, Indonesia. The Hague, Netherlands: Institute of Social Studies. 40p. (Institute of Social Studies working paper no.158)

*Land use / Labor mobility / Peasant workers / Rice / Project management / Irrigation / Indonesia / Luwu / Sulawesi*  
(Location: ODI Call No: R-ISS WP 158 Record No: L 941294)

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13078. **Cairns, J. 1992.** Land restoration: Where do we go from here? In Younos, T.; Diplas, P.; Mostaghimi, S.(Eds.), Land reclamation: Advances in research and technology. St. Joseph, MI, USA: American Society of Agricultural Engineers. pp.1-13.

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(Location: ODI Call No: ODI Journals Record No: L 942189)

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*Aquifers / Networks / Computer techniques / Geology / Groundwater / Simulation*  
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13082. **Sinha, R.K. 1993.** Taming the Thar Desert of Rajasthan, India. Desertification Control Bulletin, 22:31-35.

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*Environmental sustainability / Human resource development*

(Location: HQ Call No: 631.7.8 G000 USA Record No: H 14487)

13084. 1991. Integrated Management of Agricultural Watersheds (IMAW): Characterization of a research site near Hamdallaye, Niger. Raleigh, NC, USA: North Carolina State University. viii, 111p. (TropSoils bulletin no.91-03)

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13085. 1992. National water act - December 1992. Mexico National Water Commission. 38p.

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(Location: ICID Record No: 26251)

13086. 1989. National water policy. Journal of Indian Water Resources Society, 9(2):1-4.

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(Location: HQ Call No: P 3287 Record No: H 13829)

13087. 1994. Spain's drought crisis. World Water and Environmental Engineering, 17(6):9-10.

*Water scarcity / Drought / Water resources / Environmental effects / Spain / Portugal*

(Location: HQ Call No: PER Record No: H 15391)

13088. 1992. "TECCONILE" - Meeting of the Ministers of water affairs of the Nile basin countries, Kampala, Uganda, 7-9 December 1992. Egypt Technical Cooperation Committee for the Promotion of Development and Environmental Protection. v.p.

*Water resources development / River basins / Egypt / Nile River*

(Location: ICID Record No: 26143)

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*Water supply*

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13090. 1989. Water in the Netherlands (with annex on selection of current research topics). The Netherlands: The Netherlands Organization for Applied Scientific Research (TNO). 96p.

*Water resources / Research / Netherlands*

(Location: ICID Record No: 26036)

13091. Abdulrazzak, M.J. 1994. Review and assessment of water resources in Gulf Cooperation Council countries. Water Resources Development, 10(1):23-37.

*Water resources / Water management / Groundwater / Aquifers / Water use / Saudi Arabia*

*/ Kuwait / Bahrain / Qatar / Oman / United Arab Emirates*

(Location: HQ, ODI Call No: PER Record No: H 14103)

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*Water resource management / Water policy / Water supply / Surface water / Groundwater / Water reuse / Water quality / Land resources / Egypt / Sudan / Nile River / Aswan Dam*

(Location: HQ Call No: 338.1 G232 FAR Record No: H 15259)

13093. Adams, W.M.; Thomas, D.H.L. 1993. Mainstream sustainable development: The challenge of putting theory into practice. Journal of International Development, 5(6):591-604.

*Conservation / Wetlands / Sustainability / Wildlife / Fisheries / River basin development / Water resource management / Nigeria / Hadejia-Nguru Wetlands*

(Location: ODI Call No: ODI Journals Record No: L 940353)

13094. Aldama, A.A.; Olaiz, A.; Guitrón, A. 1994. Technology for water development. Water Resources Development, 10(3):257-276.

*Water policy / Technology transfer / Water resources development / Research institutes / Training / Flood control / River basins / Mexico*

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13095. Alirahman. 1993. Integrated water resources and rural development in Indonesia. In FAO, Integrated rural water management: Proceedings of the Technical Consultation on Integrated Rural Water Management, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.77-90.

*Water resources development / Water management / Water policy / Rural development / Water use / Economic aspects / Legal aspects / Agricultural development / Irrigation / Indonesia*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14143)

13096. Asano, T. 1994. Reusing urban wastewater - An alternative and a reliable water resource. Water International, 19(1):36-42.

*Waste waters / Water quality / Water supply / Public health / Costs / Water reuse*

(Location: HQ Call No: PER Record No: H 14213)

13097. Baheri, A.; Feyen, J.; Ashayeri, J. 1992. Optimization and/or simulation? An application to water resources allocation. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Pro-

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*Water resource management / Water allocation / Simulation / Optimization / Case studies / Iran*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14334)

**Abstract:** This paper discusses the importance of integrating optimization and simulation. A hierarchical approach is presented which involves three levels; aggregate optimization and built-in simulation, disaggregate optimization, and detailed simulation. The paper also presents the application of the approach to strategic water resources allocation for a real-life problem.

13098. **Bandyopadhyay, J.; Gyawali, D. 1994.** Himalayan water resources: Ecological and political aspects of management. Mountain Research and Development, 14(1):1-24.

*Dams / Rivers / Conflict / Water resources / Political aspects / Himalayas / Kosi Barrage / Tehri Dam*

(Location: ODI Call No: ODI Journals Record No: L 941370)

13099. **Bao, Y.; Mays, L.W. 1994.** New methodology for optimization of freshwater inflows to estuaries. Journal of Water Resources Planning and Management, 120(2):199-217.

*Water resources / Estuaries / Stream flow / Salinity / Optimization methods / Computer models / Computer techniques / Simulation models / Water management / Decision making / USA / California*  
(Location: HQ Call No: PER Record No: H 11936)

13100. **Bemmo, N.; Chocat, B. 1993.** Choix des modeles de pluie adaptes a la conception des reseaux d'assainissement pluvail urbain en zone tropicale humide: Cas de Yaounde (Cameroun) [Choice of rainwater models adapted to the elaboration of urban rainwater drainage networks in humid tropical zones: The case of Yaounde (Cameroon)] Bulletin de Liaison du Comite Interfricain Hydrauliques, 94:13-28.

*Rain / Waste water management / Urbanization / Models / Cameroon / Yaounde*

(Location: ODI Call No: ODI Journals Record No: L 940242)

13101. **Berger, T.R. 1994.** The independent review of the Sardar Sarovar Projects 1991-92. Water Resources Development, 10(1):55-66.

*Dams / Environmental control / Irrigation canals / Developing countries / Development projects / Water resources / India / Gujarat / Maharashtra / Madhya Pradesh*

(Location: HQ Call No: PER Record No: H 14105)

13102. **Bhangay, S.A. 1989.** Significance of water resources day. Journal of Indian Water Resources Society, 9(2):5-6.

*Water resources / Water availability / Water management / India*

(Location: HQ Call No: P 3287 Record No: H 13830)

13103. **Bhattacharyya, A.; Parker, E.; Raffiee, K. 1994.** An examination of the effect of ownership on the relative efficiency of public and private water utilities. Land Economics, 70(2):197-209.

*Water supply / Private ownership / Public sector*

(Location: ODI Call No: ODI Journals Record No: L 941341)

13104. **Biswas, A.K. (Ed.) 1994.** International waters of the Middle East: From Euphrates-Tigris to Nile. Bombay, India: OUP. xvii, 221p. (Water resources management series 2)

*Water resource management / Water resources development / River basin development / International cooperation / Political aspects / Legal aspects / History / Case studies / Water transfer / Environmental effects / Irrigation canals / Dams / Middle East / Israel / Iraq / Turkey / Syria / Sudan / Egypt / Africa / Nile River / Euphrates River / Tigris River / Jordan River / Dead sea*

(Location: HQ Call No: 333.91 GG30 BIS Record No: H 14384)

13105. **Biswas, A.K. 1994.** Sustainable water resources development: Some personal thoughts. Water Resources Development, 10(2):109-116.

*Water resources development / Environmental effects / Sustainability / Development policy*

(Location: HQ, ODI Call No: PER Record No: H 14791)

13106. **Biswas, A.K.; Jellali, M.; Stout, G.E. (Eds.) 1993.** Water for sustainable development in the twenty-first century. Delhi, India: OUP. xvi, 273p. (Water resources management series 1)

*Water resources development / Water resource management / Sustainability / Water policy / Arid zones / Surface water / Watershed management / Dams / Groundwater / Water quality / Water reuse / Evapotranspiration / Tube wells / Economic impact / Financing / Case studies / Africa / Africa South of Sahara / Netherlands / Brazil / Japan / Egypt / India / Amazon / Aral Sea / Maharashtra*

(Location: HQ, ICID Call No: 333.91 G000 BIS Record No: H 14385)

13107. **Bouwer, H. 1994.** Irrigation and global water outlook. Agricultural Water Management, 25(3):221-231.

- Water resource management / Water reuse / Effluents / Waste waters / Water conservation / Irrigation water / Water transfer / Climate*  
(Location: HQ Call No: PER Record No: H 14968)
13108. **Carlsen, A.J.; Strand, J.; Wenstop, F. 1993.** Implicit environmental costs in hydroelectric development. An analysis of the Norwegian Master Plan for Water Resources. *Journal of Environmental Economics and Management*, 25:201-211.  
*Environmental effects / Water resources / Hydroelectric schemes / Development projects / Decision making / Models / Norway*  
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13109. **CIHEAM; IAM-B. 1993.** Workshop on environmentally sound water management of protected agriculture under Mediterranean and arid climates, Bari, Italy, 16-18 July 1993. Bari, Italy: CIHEAM. v.p.  
*Water management / Environmental sustainability / Agricultural production / Arid zones / Water requirements / Water balance / Evapotranspiration / Drip irrigation / Salinity / Tomatoes / Irrigation water / Mediterranean Countries / Turkey / Egypt / France / Italy / Tunisia / Portugal / Greece / Netherlands / Spain / Morocco*  
(Location: HQ Call No: 333.91 GG20 CIH Record No: H 13973)
13110. **Conniff, R. 1993.** California: Desert in disguise. *National Geographic*. Special edition - Water, November:38-53.  
*Water resources / Water allocation / Drought / USA / California*  
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13111. **Cortner, H.J.; Moote, M.A. 1994.** Trends and issues in land and water resources management: Setting the agenda for change. *Environmental Management*, 18(2):167-173.  
*Water resource management / Land management / Development policy / Decision making / USA*  
(Location: HQ Call No: P 3498 Record No: H 14641)
13112. **Currie, J.C.; Pepper, A.T. (Eds.) 1993.** Water and the environment. Chichester, UK: Ellis Horwood. x, 465p.  
*Water resources / Environmental effects / Environmental policy / Reservoirs / Water management / Waste waters / Water use / Groundwater management / Groundwater extraction / Drainage / Water supply / Canals / Case studies / Pollution control / Simulation / GIS / Sedimentation / Rivers / Flood control / UK / Sri Lanka / Netherlands / Hong Kong / Birmingham / London / Sleaford / Derwent / Roadford Scheme / Mahaweli Project*  
(Location: HQ Call No: 333.91 G000 CUR Record No: H 15014)
13113. **D'Silva, A.M.; Maughan, O.E. 1994.** Multiple use of water: Integration of fish culture and tree growing. *Agroforestry Systems*, 26(1):1-7.  
*Agroforestry / Aquaculture / Fish farming / Irrigation / Water use*  
(Location: ODI Record No: L 941739)
13114. **Dan Bithu, B. 1994.** Micro-catchment rain water harvesting in Western Thar Desert, India: A sustainable production alternative. News from the field: News from Balochistan, Pakistan; Nigeria and Western Thar Desert, India. London, UK: ODI. pp.20-27. (ODI network paper 31)  
*Water harvesting / Rain / Arid zones / Soil moisture / India*  
(Location: HQ Call No: ODI/94/31 Record No: H 14530)
13115. **Das Gupta, A. 1993.** Groundwater quality management. In Biswas, A.K.; Jellali, M.; Stout, G.E.(Eds.), *Water for sustainable development in the twenty-first century*. Delhi, India: OUP. pp.177-188.  
*Groundwater management / Groundwater development / Water quality / Water pollution / Monitoring / Legislation / Asia*  
(Location: HQ Call No: 333.91 G000 BIS Record No: H 14404)
13116. **Davis, J.; Garvey, G.; Wood, M. 1993.** Developing and managing community water supplies. Oxford, UK: Oxfam. 178p.  
*Environmental effects / Water supply / Hygiene / Sanitation / Project planning / Management / Community participation / Finance / Maintenance / Project appraisal*  
(Location: ODI Call No: ACG-W Record No: L 940586)
13117. **de Bruijkere, F.L.G. 1993.** The natural development and water management of lake Volkerak-Zoom, the Netherlands. In Currie, J.C.; Pepper, A.T. (Eds.), *Water and the environment*. Chichester, UK: Ellis Horwood. pp.420-431.  
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13118. **de Rooy, C.; Tobin, V. 1993.** Capacity building for integrated rural water management: Building managerial capabilities in developing countries. In FAO, *Integrated rural water management: Proceedings of the Technical Consultation on Integrated Rural Water Management*, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.223-230.

*Water management / Sanitation / Institution building / Developing countries / Rural development*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14156)

13119. **Dhakal, N.H. 1993.** Indigenous management of water resources in Karkhola Basin of Gorkha District. In Tamang, D.; Gill, G.J.; Thapa, G.B. (Eds.), Indigenous management of natural resources in Nepal. Kathmandu, Nepal: HMG Ministry of Agriculture; Winrock International. pp.265-277.

*Water resource management / Irrigation management / River basin development / Nepal*

(Location: HQ Call No: 333.7 G726 TAM Record No: H 14111)

13120. **Dharmasiri, J.K. 1993.** Nuclear technology for water resources development. Nuclear News, 14(1):1-2, 12.

*Water resources development / Groundwater / Engineering / Measurement*

(Location: HQ Call No: P 3404 Record No: H 14249)

13121. **Dinar, A.; Wolf, A. 1994.** International markets for water and the potential for regional cooperation: Economic and political perspectives in the Western Middle East. Economic Development and Cultural Change, 43(1):43-66.

*Models / Water supply / Economic aspects / Irrigation / Political aspects / Middle East / Egypt / Israel / Palestine / Ethiopia / Sudan / Nile River*

(Location: ODI Call No: ODI Journals Record No: L 943100)

13122. **Dudley, N.J.; Musgrave, W.F. 1993.** Economics of irrigation water allocation under uncertain conditions. In Biswas, A.K.; Jellali, M.; Stout, G.E.(Eds.), Water for sustainable development in the twenty-first century. Delhi, India: OUP. pp.126-137.

*Water allocation / Water rights / Decision making / Water policy / Water management / Uncertainties / Australia / USA*

(Location: HQ Call No: 333.91 G000 BIS Record No: H 14401)

13123. **Edwards, D. 1994.** Small farmers and protection of the watersheds: The experience of Jamaica since the 1950s - Summary Report. ESCOR Research Project: (R5026) Resource use by small farmers, the case of hillside cultivation in Jamaica, submitted to ODA. 26p.

*Watershed management / Small farms / Soil conservation / Jamaica*

(Location: ODI Call No: A 828. RRMG Record No: L A 828)

13124. **Edwards, D. 1994.** Small farmers and protection of the watersheds: The experience of Jamaica since the 1950s - Final Report. ESCOR Research Project: (R5026)

Resource use by small farmers, the case of hillside cultivation in Jamaica, submitted to ODA. 73p.

*Watershed management / Small farms / Soil conservation / Jamaica*

(Location: ODI Call No: A 829. RRMG Record No: L A 829)

13125. **Egyptian National Committee, ICID. 1993.** Proceedings of Nile 2002 conference: Comprehensive water resources development of the Nile Basin - Getting started, Aswan, Egypt, 1-6 February 1993. Egypt Aswan. v.p.

*Water resources development / River basin development / Conferences / Egypt / Nile River*

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*Water resource management / Water policy / Arid zones / Irrigated farming / Sustainability / USA / Mexico / Asia / Aral Sea / Colorado*

(Location: HQ Call No: 333.91 G000 BIS Record No: H 14396)

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*Water availability / Water use / Sustainability / Water stress / Population / Water scarcity / Health / Economic development / Groundwater extraction / Pollution / Diseases / Water demand / Ecosystems / Climate / Environment / Conflict / Water quality / Statistics / India / Africa / USA / Saudi Arabia / Mexico / China / Peru / Sri Lanka / California / Nile River*

(Location: HQ, ICID Call No: 333.91 G000 ENG Record No: H 13820)

13128. **Ericson, J. 1992.** The effects of improved water supply in two villages in Botswana A preliminary report. Stockholm, Sweden: University of Stockholm. Environment and Development Studies Unit. 12p. (University of Stockholm. Environment and Development Studies Unit working paper no.16)

*Water supply / Water use / Water demand / Botswana / Bokaa / Mmathethe*

(Location: ODI Call No: R-Stockholm EDSU WP 16 Record No: L 941770)

13129. **ESCAP. 1993.** Study on assessment of water resources of member countries and demand by user sectors - Japan: Water resources and their use. New York, NY, USA: UN. 40p.

*Water resources / Water demand / Water use / Assessment / Japan*

(Location: ICID Record No: 26150)

13130. **Falkenmark, M. 1994.** Back on the agenda: Integration of land and water. Stockholm Water Front, 1:8-9.

*Water resources / Land use / Environmental policy*  
(Location: HQ Call No: P 3394 Record No: H 14239)

13131. **Falkenmark, M. 1993.** Environment and development: Urgent need for a water perspective. In Biswas, A. K.; Jellali, M.; Stout, G.E. (Eds.), Water for sustainable development in the twenty-first century. Delhi, India: OUP. pp.24-41.

*Environmental effects / Sustainability / Water scarcity / Water demand / Social aspects*  
(Location: HQ Call No: 333.91 G000 BIS Record No: H 14395)

13132. **FAO. 1993.** Country and sub-regional programmes - International action programmes on water and sustainable agriculture development. Rome, Italy: FAO. v.p.

*Sustainable agriculture / Agricultural development / Water resources*  
(Location: ICID Record No: 26252)

13133. **FAO. 1993.** Integrated rural water management: Proceedings of the Technical Consultation on Integrated Rural Water Management, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. viii, 346p.

*Water management / Rural development / Agricultural production / Case studies / Water use efficiency / Water policy / Strategy planning / Water resources development / Environmental control / Waste waters / Water supply / Sanitation / Drainage / Research / Disease vectors / Irrigated farming / Communication / Agricultural extension / Indonesia / Turkey / Oman / Egypt / Mexico / Burundi*  
(Location: HQ Call No: 333.91 G000 FAO Record No: H 14136)

13134. **Francis, C. 1992.** Salt solution. Water Services, September:4p.

*Desalinization / Water shortage / UK*  
(Location: ODI Call No: ODI Journals Record No: L 942381)

13135. **Frederiksen, H.D.; Berkoff, J.; Barber, W. 1994.** Principles and practices for dealing with water resources issues. Washington, DC, USA: World Bank. vii, 40p. (World Bank technical paper no.233)

*Water resources development / Water supply / Water policy / Economic aspects / Water allocation / Water rights / Land use / Maintenance / Costs*  
(Location: HQ, ICID Call No: 333.91 G000 FRE Record No: H 14489)

13136. **Frederiksen, H.D. 1992.** Water resources institutions - Some principles and practices. Washington, DC, USA: World Bank. 40p. (World Bank technical paper no.191)

#### *Water resources / Institutions*

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13137. **Frederiksen, H.D.; Berkoff, J.; Barber, W. 1993.** Water resources management in Asia. Vol.1 - Main report. Washington, DC, USA: World Bank. xxxii, 149p. (World Bank technical paper no.212 / Asia Technical Department series)

*Planning / Water supply / Water resource management / Land management / River basins / Water law / Water rights / Flood control / Economic aspects / Financing / Waterlogging / Salinity / Wetlands / Environmental effects / Social aspects / Development banks / Policy / Water users' associations / Asia*

(Location: HQ, ICID Call No: 333.91 G570 FRE Record No: H 14164)

13138. **Frohardt, P. 1994.** The Colorado watershed protection approach. Colorado Water, 11(5):16-17.

*Watershed management / Water quality / Water resource management / USA / Colorado*  
(Location: HQ Call No: P 3615 Record No: H 15406)

13139. **Garzon, C.E. 1984.** Water quality in hydroelectric projects: Considerations for planning in tropical forest regions. Washington, DC, USA: World Bank. ix, 33p. (World Bank technical paper no.20)

*Water quality / Reservoirs / Rivers / Forests*  
(Location: HQ Call No: 333.91 G000 GAR Record No: H 14132)

13140. **Gasser, M.M.; Saad, M.B.A. 1991.** The effect of the Nile water management on its hydraulic structures. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.159-171.

*River basin development / Dams / Hydrology / Water management / Egypt / Nile River*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14737)

13141. **Geraedts, J.M.; Kusse, P.J. 1993.** Water management, an important steering factor in land development: Elaboration for the Roden-Norg area. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.923-937.

*Land development / Water management / Rural development / Natural resources / Water conservation / Drainage / Netherlands*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15256)

13142. **Golubev, G.N. 1993.** State and perspectives of Aral Sea problem. In Biswas, A.K.; Jellali, M.; Stout, G.E. (Eds.), Water for sustainable development in the twenty-first century. Delhi, India: OUP. pp.245-254.

*Hydrology / Environmental effects / Health / Environmental degradation / Irrigation / Development / Russian Federation / Aral sea*  
(Location: HQ Call No: 333.91 G000 BIS Record No: H 14409)

13143. **González-Villarreal, F.; Garduño, H. 1994.** Water resources planning and management in Mexico. *Water Resources Development*, 10(3):239-255.

*Water resource management / Water policy / Water law / Water use efficiency / Modernization / Water quality / Waste waters / Aquatic weeds / Flood control / Forecasting / Mexico*

(Location: HQ Call No: PER Record No: H 15469)

13144. **Gopalakrishnan, R. 1993.** Policies, strategies and planning for integrated rural water management - A case study of Jhabua District in India. In *FAO, Integrated rural water management: Proceedings of the Technical Consultation on Integrated Rural Water Management*, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.67-76.

*Water management / Water policy / Strategy planning / Rural development / Case studies / Poverty / India / Jhabua District*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14142)

13145. **Gregorovic, Z.; Nikolin, S. 1992.** Strategy and development of the hydrosystem Danube-Tisa-Danube. In *Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in co-operation with the European Committee for Water Resources Management*, Leuven, Belgium, 14-17 September 1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.63-72.

*River basin development / Water resources / Water supply / Irrigation canals / Drainage / Yugoslavia*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14336)

**Abstract:** Danube-Tisa-Danube is a multipurpose hydrosystem designed for drainage, supply of water, protection from floods and navigation. The Danube and the Tisa river with their great discharge capacities provide sufficient water for this hydrosystem. The history of the human life in Voivodina reflects man's struggle against the whims of nature. Large construction works and other measures were undertaken to decrease the influence of natural water cycles: protect against surplus waters and provide water supply. Nowadays the Danube-Tisa-Danube hydrosystem is a part of every day life in Voivodina.

13146. **Gupta, A.D.; Amaraweera, H.B.M.P. 1994.** Assessment of long term withdrawal rate for a coastal aquifer. *Water Resources Journal*, March:64-74.

*Aquifers / Water resource management / Water supply / Sri Lanka / Mannar Island*  
(Location: ODI Record No: L 942944)

13147. **Guymon, G.L.; Khan, M.N.; Collins, M.; Hromadka, T.V. 1994.** Diffusion hydrodynamic model of shallow estuary. *Journal of Water Resources Planning and Management*, 120(2):253-266.

*Water resources / Mathematical models / Estuaries / Calibrations / USA / California*

(Location: HQ Call No: PER Record No: H 14083)

13148. **Hadimoeljono, M.B.; Triweko, R.W. 1993.** Water resources development in Indonesia Problems and strategies. In *FAO, Integrated rural water management. Proceedings of the Technical Consultation on Integrated Rural Water Management*, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.91-92.

*Water resources development / Water management / Strategy planning / Indonesia*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14144)

13149. **Harris, R. 1994.** New world water 1994: The international review of water and wastewater in developing countries. London, UK: Sterling. 192p.

*Water resources / Waste waters*

(Location: ICID Record No: 26181)

13150. **Hartvelt, F. 1993.** Capacity building for water sector development. In *FAO, Integrated rural water management: Proceedings of the Technical Consultation on Integrated Rural Water Management*, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.219-222.

*Water resources / Water supply / Sanitation / Institutions*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14155)

13151. **Hefny, K.; Attia, F.; Tuinhof, A. 1993.** Tubewell drainage and regional groundwater planning in Egypt. In *Biswas, A.K.; Jellali, M.; Stout, G.E. (Eds.), Water for sustainable development in the twenty-first century*. Delhi, India: OUP. pp.227-235.

*Tube wells / Drainage / Groundwater development / Aquifers / Egypt / Nile River*

(Location: HQ Call No: 333.91 G000 BIS Record No: H 14407)

13152. **Heldt, B.O. 1994.** Water sharing: The road to peace? *Stockholm Water Front*, 1:2-3.

*Water resources / Water distribution / International cooperation / Conflict / Resource allocation / Water scarcity / Israel / Palestine / Arab countries / Middle East / Egypt / Syria / Iraq / Ethiopia / Turkey / Lebanon*

(Location: HQ Call No: P 3394 Record No: H 14237)



13153. **Heun, J.C. 1993.** Water-management in Indonesian tidal lowlands: Lessons from the past and challenges for the future. In Zakaria, S. (Ed.), *Agricultural drainage: Proceedings of the National Conference on Agricultural Drainage*, Melaka, Malaysia, 9-12 February 1993. Melaka, Malaysia: MANCID. pp.3.21-3.35.  
*Water management / Agricultural development / Rice / Agricultural policy / Indonesia*  
(Location: HQ Call No: 631.62 G714 ZAK Record No: H 14717)
13154. **Hudson, N.W. 1987.** Soil and water conservation in semi-arid areas. Rome, Italy: FAO. xiii, 172p. (FAO soils bulletin 57)  
*Soil conservation / Water conservation / Arid zones / Land resources / Soil classification / Agriculture / Water harvesting / Water storage / Groundwater development / Surface drainage*  
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13155. **Hufschmidt, M.M.; Tejwani, K.G. 1993.** Integrated water resource management: Meeting the sustainability challenge. Paris, France: UNESCO. 37p. (IHP humid tropics programme series no.5)  
*Water resource management / Water resources development / Sustainability / Water demand / Water supply / Watersheds / Water pollution / South East Asia / Asia / Pacific Islands*  
(Location: HQ Call No: 333.91 G800 HUF Record No: H 15051)
13156. **Hufschmidt, M.M. 1993.** Water policies for sustainable development. In Biswas, A.K.; Jellali, M.; Stout, G.E. (Eds.), *Water for sustainable development in the twenty-first century*. Delhi, India: OUP. pp.60-69.  
*Water policy / Water resource management / Sustainability*  
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13157. **Huntzinger, T.L.; Ellis, M.J. 1993.** Central Nebraska River Basins, Nebraska. *Water Resources Bulletin*, 29(4):533-574.  
*River basins / Water resources / Water quality / Environmental effects / Aquifers / Hydrology / Groundwater / USA / Nebraska*  
(Location: HQ Call No: PER Record No: H 13902)
13158. **Idike, F.I.; Campling, P.; Gobin, A.M.L. 1992.** Water resources for rural communities in Enugu and Anambra States, Nigeria: Problems and potentials. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in co-operation with the European Committee for Water Resources Management*, Leuven, Belgium, 14-17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.697-705.  
*Water resources / Rural welfare / Policy / Groundwater / Agriculture / Water harvesting / Water delivery / Nigeria / Enugu / Anambra*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14450)
13159. **India. Central Water Commission. 1992.** Draft guidelines for sustainable water resources development and management: Case study. Kaduna Reservoir Project - Vol.II. Unpublished report. 157p.  
*Reservoirs / Case studies / Water resources development / Water resource management / Sustainability / India*  
(Location: ICID Record No: 26066)
13160. **India. Central Water Commission. 1992.** Guidelines for sustainable water resources development and management. New Delhi, India: CWC. 234p.  
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(Location: ICID Record No: 26065)
13161. **Islam, M.Z. 1994.** Regional surface water availability during dry and monsoon seasons in Bangladesh. *Journal of Irrigation Engineering and Rural Planning*, 26:31-47.  
*Water resources / Water availability / Surface water / River basins / Stream flow / Salinity / Water demand / Bangladesh*  
(Location: HQ Call No: PER Record No: H 14380)
13162. **IWRA Committee on Water Strategies. 1993.** Water strategies for the twenty-first century. In Biswas, A.K.; Jellali, M.; Stout, G.E. (Eds.), *Water for sustainable development in the twenty-first century*. Delhi, India: OUP. pp.167-173.  
*Water resources development / Environmental effects / International cooperation / Water management*  
(Location: HQ Call No: 333.91 G000 BIS Record No: H 14403)
13163. **Iyer, R.R. 1994.** Indian federalism and water resources. *Water Resources Development*, 10(2):191-202.  
*Water resources / River basins / Water policy / Water rights / Water law / Conflict / Social participation / India*  
(Location: HQ, ODI Call No: PER Record No: H 14797)
13164. **Iyer, S.S. 1989.** Water resources of India: An overview. *Journal of Indian Water Resources Society*, 9(2):7-9.  
*Water resources / Water use / Rivers / Water transport / India*  
(Location: HQ Call No: P 3287 Record No: H 13831)

13165. **Jacobs, J.W. 1994.** Toward sustainability in Lower Mekong River Basin Development. *Water International*, 19(1):43-51.

*River basin development / Environmental sustainability / International cooperation / Energy resources / South East Asia / Cambodia / Laos / Thailand / Vietnam*  
(Location: HQ Call No: PER Record No: H 14214)

13166. **Jhakade, G.S. 1989.** Need for development of water resources and water conservation. *Journal of Indian Water Resources Society*, 9(2):63-64.

*Water resources development / Water conservation / India*  
(Location: HQ Call No: P 3287 Record No: H 13845)

13167. **Johnson, P.A.; Curtis, P.D. 1994.** Water balance of Blue Nile River Basin in Ethiopia. *Journal of Irrigation and Drainage Engineering*, 120(3):573-590.

*River basins / Water balance / Stream flow / Hydrology / Watersheds / Rainfall-runoff relationships / Mathematical models / Calibrations / Ethiopia / Sudan / Egypt / Nile River*  
(Location: HQ Call No: PER Record No: H 14417)

13168. **Jordaan, J.; Plate, E.J.; Prins, E.; Veltrop, J. 1993.** Water in our common futureA research agenda for sustainable development of water resources. Paris, France: Committee on Water Research (COWAR) 90p.

*Water resources development / Sustainability / Research priorities / Water use / Technology transfer*  
(Location: HQ Call No: 333.91 G000 JOR Record No: H 14312)

13169. **Jordan, J. 1993.** Committee on Water Research COWAR - Water in our common futureA research agenda for sustainable development of water resources. Paris, France: ICSU; UATI; International Hydrological Program, UNESCO. 90p.

*Water resources development / Sustainability*  
(Location: ICID Record No: 26235)

13170. **Julien, B. 1994.** Water quality management with imprecise information. *European Journal of Operational Research*, 76:15-27.

*Water quality / Water management / Linear programming / Decision making / Models*  
(Location: HQ Call No: P 3607 Record No: H 15294)

13171. **Kandiah, A.; Stratford, C. 1993.** Research and development needs for integrated rural water management. In *FAO, Integrated rural water management: Proceedings of the Technical Consultation on Integrated Rural Water Management*, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.109-120.

*Water management / Rural development / Research / Irrigation water / Water use efficiency / Water quality / Water reuse / Salinity / Waste waters*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14146)

13172. **Kinley, D. 1994.** Water and sustainable development. New York, NY, USA: UNDP. 43p.

*Water resource management / Water conservation / Pumps / Energy resources / Women / Health / Sanitation / Environmental sustainability / Farmers' attitudes / Development aid / Rural development / Zambia / Fiji / Pakistan / Singapore / Mexico / Honduras / Colombia / Morocco / Yemen*  
(Location: HQ, ICID Call No: 333.91 G000 KIN Record No: H 12110)

13173. **Kirmani, S.S. 1993.** Managing the international waterways of the Aral Sea Basin and the experience of co-operative efforts on the Indus and the Mekong River Basins. In *World Bank, Seminar on Management of International Waterways*, Almaty, Kazakhstan, 11 June 1993. pp.7-13.

*Water resources development / International cooperation / Water policy / Rivers / Legal aspects / Water resource management / Kazakhstan / Kyrgyzstan / Tajikistan / Turkmenistan / Uzbekistan / India / South East Asia / Mekong River / Indus River*  
(Location: HQ Call No: P 2986 Record No: H 13662)

13174. **Kliot, N. 1994.** Water resources and conflict in the Middle East. London, UK: Routledge. 309p.

*Water resources / Conflict / Middle East*  
(Location: ICID Record No: 26157)

13175. **Kondolf, G.M.; Vorster, P. 1993.** Changing water balance over time in Rush Creek, eastern California, 1860-1992. *Water Resources Bulletin*, 29(5):823-832.

*Water resource management / Water balance / Ecology / USA / California*  
(Location: HQ Call No: PER Record No: H 14069)

**Abstract:** Rush Creek, the principal tributary to Mono Lake, has undergone profound hydrologic modifications as a result of flow regulation for hydroelectric generation and irrigation, diversions for irrigated agriculture, and diversions for water export to the City of Los Angeles. Lower Rush Creek (the lowermost 13 km downstream of Grant Lake Reservoir) was dry by 1970, but now receives flow as a result of court-ordered efforts to restore former ecological conditions. Using available historic data and recent field measurements, we constructed the water balance for Lower Rush Creek, identifying six distinct historical periods characterized by very different

patterns of gain and loss. The hydrologic patterns must be understood as a basis for modeling ecosystem response to streamflow alteration. A gradually gaining stream under natural conditions, the advent of irrigation diversions caused the middle reaches of Lower Rush Creek to be often completely dry, while irrigation-recharged springs still maintained a baseflow in the downstream "Meadows" ranch. Increased water exports from the basin subsequently reduced irrigation and dried up the springs.

13176. **Kuijpers, C.B.F. 1993.** Integrated water management in the Netherlands: Myth or practice? In Biswas, A.K.; Jellali, M.; Stout, G.E. (Eds.), *Water for sustainable development in the twenty-first century*. Delhi, India: OUP. pp.116-125.

*Water management / Institutional constraints / Netherlands / Naardermeer*

(Location: HQ Call No: 333.91 G000 BIS Record No: H 14400)

13177. **Kulkarni, S.Y. 1993.** Socio-economic impacts of water development: Case study of Mula Project. In Biswas, A.K.; Jellali, M.; Stout, G.E. (Eds.), *Water for sustainable development in the twenty-first century*. Delhi, India: OUP. pp.236-244.

*Water development / Water resources / Social impact / Economic impact / Case studies / India / Maharashtra*

(Location: HQ Call No: 333.91 G000 BIS Record No: H 14408)

13178. **Le Moigne, G. 1993.** World Bank policy for financing projects on international waterways. In World Bank, *Seminar on Management of International Waterways*, Almaty, Kazakhstan, 11 June 1993. pp.1-6.

*Water resources development / Economic policy / Development aid / Financing / Groundwater / Aquifers / Legal aspects / Water policy*

(Location: HQ Call No: P 2986 Record No: H 13602)

13179. **Leahy, P.P.; Ryan, B.J.; Johnson, A.I. 1993.** An introduction to the U.S. Geological Survey's National Water-Quality Assessment Program. *Water Resources Bulletin*, 29(4):529-532.

*Water quality / Water resources / Surveys / USA*

(Location: HQ Call No: PER Record No: H 13901)

13180. **Linden, A.M.V.D. 1992.** Water management in the floodplain of Cambodia. *Water Resources Journal*, September:16-22.

*Water management / Flood plains / River basins / Cambodia*

(Location: HQ Call No: PER Record No: H 13705)

**Abstract:** This paper is based on experience gained in Cambodia during three years of fieldwork with

the Department of Hydrology, Ministry of Agriculture. It concentrates on the technical, organizational and environmental aspects of water management and related subjects, such as agriculture, forestry and fisheries, in the floodplain of Cambodia.

13181. **Lo, C.W.H.; Tang, S.Y. 1994.** Institutional contexts of environmental management: Water pollution control in Guangzhou, China. *Public Administration and Development*, 14(1):53-64.

*Water pollution / Pollution control / Urbanization / Local government / Environment / Institutions / China*

(Location: ODI Call No: ODI Journals Record No: L 940876)

13182. **Lohani, B.N. 1982.** Water resources development and typical methodologies for assessment of their environmental impacts. *Journal of Indian Water Resources Society*, 3(2):1-14.

*Water resources development / Environmental effects / Methodology*

(Location: ODI Call No: ODI Journals Record No: L 942447)

13183. **Lowi, M.R. 1993.** Water and power: The politics of a scarce resource in the Jordan River basin. Cambridge, UK: CUP. xix, 291p. (Cambridge Middle East Library: 31)

*River basin development / Water resources development / Water policy / Political aspects / International cooperation / Conflict / Water supply / Jordan / Middle East / Israel / Lebanon / Syria / Jordan River*

(Location: HQ Call No: 333.91 G698 LOW Record No: H 14694)

13184. **Mao, N.; Mays, L.W. 1994.** Goal programming models for determining freshwater inflows to estuaries. *Journal of Water Resources Planning and Management*, 120(3):316-329.

*Water resources / Mathematical models / Stream flow / Salinity / Estuaries / USA*

(Location: HQ Call No: PER Record No: H 14285)

13185. **Mather, T.H.; Appelgren, B. 1993.** Policies, strategies and planning for integrated rural water management. In FAO, *Integrated rural water management. Proceedings of the Technical Consultation on Integrated Rural Water Management*, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.17-36.

*Water management / Rural development / Water policy / Strategy planning*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14137)

13186. **Matthews, G.J. 1994.** A partner for life. *Stockholm Water Front*, 1:4.

*Water resource management / Water policy*

(Location: HQ Call No: P 3394 Record No: H 14238)

13187. **McNealy, D.D. 1993.** The water agreements between the USA and Mexico on the use and development of the Colorado and Rio Grande Rivers. In World Bank, Seminar on Management of International Waterways, Almaty, Kazakhstan, 11 June 1993. pp.14-17.

*Water resources development / International cooperation / Water policy / Rivers / Legal aspects / Water resource management / USA / Mexico / Colorado River / Rio Grande River*

(Location: HQ Call No: P 2986 Record No: H 13663)

13188. **Mei Xie. 1993.** Using water efficiently: Technological options. Washington, DC, USA: World Bank. 52p. (World Bank technical paper no.204)

*Water use efficiency / Technology*  
(Location: ICID Record No: 26054)

13189. **Mestre, E.; Leon, L.F.; Martinez-Austria, P. 1994.** Integral approach to water quality conservation in basins. Water Resources Development, 10(3):277-289.

*Water resource management / Water quality / Water conservation / River basins / Surface water / Groundwater / Water pollution / Mathematical models / Flow measurement / Velocity / Mexico / Lerma-Chapala Basin*

(Location: HQ Call No: PER Record No: H 15471)

13190. **Mitchell, J.G. 1993.** James Bay: Where two worlds collide. National Geographic. Special edition - Water, November:66-75.

*Water resources / Natural resources / Environment / Development policy / Canada*

(Location: HQ Call No: 333.91 G000 NAT Record No: H 13701)

13191. **Morvaridi, B. 1994.** Management of water supply and sanitation projects in Maharashtra State, India. Journal of International Development, 6(1):129-132.

*Water supply / Sanitation / Management / Training / Farmer participation / India / Maharashtra*

(Location: ODI Call No: ODI Journals Record No: L 940509)

13192. **N'diaye, B. 1993.** Water and African development. In Biswas, A.K.; Jellali, M.; Stout, G.E. (Eds.), Water for sustainable development in the twenty-first century. Delhi, India: OUP. pp.18-23.

*Water resources development / Development aid / Africa*

(Location: HQ Call No: 333.91 G000 BIS Record No: H 14394)

13193. **Nasser Ezzat, M. 1994.** The Nile 2002 Conference - Water resources development - Country report Egypt, Khartoum, Sudan. Unpublished report. v.p.

*Water resources development / River basins / Egypt / Nile River*

(Location: ICID Record No: 26141)

13194. **Pakistan Agricultural Research Council. 1990.** Proceedings of the Indo-Pak Workshop on Soil Salinity and Water Management, 10-14 February 1990, Islamabad, Pakistan. Vols.I and II. Islamabad, Pakistan: IWASRI. 272p.; pp.273-529.

*Soil salinity / Water management / India / Pakistan*  
(Location: ICID Record No: 26013)

13195. **Pallas, P.; Faurés, J.M.; Comeau, A. 1993.** Global water information system: A contribution to integrated rural water management. In FAO, Integrated rural water management: Proceedings of the Technical Consultation on Integrated Rural Water Management, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.59-66.

*Water resources / Water management / Rural development / Information systems / Databases / Water use / Water management / Simulation*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14141)

13196. **Parfit, M. 1993.** New ideas, new understanding, new hope. National Geographic. Special edition - Water, November:108-119.

*Water resources / Water quality / Water pollution / USA*

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*Water resources / Dams / USA*

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(*Location:* HQ *Call No:* PER *Record No:* H 14040)  
**Abstract:** Analysis of weekly water use in Los Angeles and San Diego, California, indicates that drought response programmes in both cities achieved 22-25 per cent reductions in 1991, despite differences in their respective approaches to conservation. Most of the reductions were achieved during the summer of 1991, but water use even during a late fall wet period continued to be significantly below levels that would have been expected without conservation. It is suggested that more attention be given to actual levels of compliance with water use restrictions than to nominal differences of voluntary versus mandatory conservation.
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*Water resources / Reservoirs / Environmental effects / Forecasting / Hydrology / Poland*

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*Drought / Water policy / Water costs / Water management / Hydrology / USA / Florida*

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*Water resources / Political attitudes / Waste waters / Water quality / Water shortage / Groundwater / Water pollution / Irrigation systems / Water management / Water policy / Water rates / Middle East*

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*Water supply / Research / Appropriate technology / Africa / Nordic Countries*

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*Water management / History / Land reclamation / Netherlands*

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*Soil conservation / Water conservation / Institutional constraints / Labor / Water harvesting / Sudan / Kassala / Beja*

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*Water harvesting / Water resources / Sustainable agriculture / Runoff / Farming systems / Bunds / Construction / Maintenance / Farmer participation / Villages / Traditional farming / Environment / Policy / Africa South of Sahara / Sudan / Kassala*

(Location: HQ, ODI Call No: 333.91 G100 VAN Record No: H 13779)

13249. **van Norden, A. 1992.** International water tribunal. *Waterlines*, 11(1):2-5.

*Water pollution / Ecology*

(Location: ODI Call No: ODI Journals Record No: L 942455)

13250. **Vickers, A.; Markus, E.J. 1993.** Creating economic incentives for conservation. *Water Resources Journal*, 178:1-5.



*Water resources development / Water use efficiency / Water conservation / Water policy / Water rates / Economic aspects / USA*

(Location: HQ Call No: PER Record No: H 14039)

**Abstract:** US water suppliers are increasingly incorporating conservation into their management strategies as a way to enhance supply capacities and shift consumer demand toward sustainable-use patterns. Incentives to the utility for following this management strategy, aside from the conserving of water, include reduced investment and operating costs and preservation of environmental assets. Disincentives include revenue shortfalls, more frequent rate adjustments, and difficulty predicting future demand. Recent experience by the electric utility industry indicates innovative programme-financing mechanisms may be required if conservation is to be a worthwhile and economically safe venture, particularly for investor-owned, regulated water utilities. For example, an important assumption associated with incentive strategies is that increased water efficiency is an equal substitute for water supply capacity and has equivalent value in the marketplace. Utilities need to quantify the economic and environmental assets of a conservation programme so those elements may be justly incorporated into the financial considerations of alternative supply-and demand-side planning options.

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*Water resource management / Water resources development / Water law / Mexico*

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*Soil conservation / Water conservation / Appropriate technology / Costs / Burkina Faso / Mali / Niger / Sahel*

(Location: ODI, HQ Call No: ODI Journals Record No: L 940243)

13253. **Vohra, B.B.** 1975. Land and water management problems in India. A collection of unpublished conference papers by B.B. Vohra on Land and Water Management, compiled by the Training Division, Department of Personnel and Administrative Reforms, Cabinet Secretariat, New Delhi, India. ii, 123p. (Training vol.8)

*Land management / Water management / Water resources / Natural resources / Environmental effects / Irrigation management / Groundwater development / India*

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13254. **Ward, H.** 1994. A new face for urban rivers: Reclaiming a lost resource. Colorado Water, April:12-14.

*Rivers / Project planning / Environmental effects / USA*

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13255. **Watt, G.D.; Gill, B.** 1993. Investigations into the proposed water abstraction from the River Spey. In Currie, J.C.; Pepper, A.T. (Eds.), Water and the environment. Chichester, UK: Ellis Horwood. pp.302-311.

*Rivers / Water use / Water quality / Water law / Pumping / Environmental effects / UK / Scotland*

(Location: HQ Call No: 333.91 G000 CUR Record No: H 15018)

13256. **Watters, G.; Warner, D.B.** 1993. Country-level monitoring of water supply and sanitation as a management tool: Case study - Togo. In FAO, Integrated rural water management: Proceedings of the Technical Consultation on Integrated Rural Water Management, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.213-216.

*Water management / Water supply / Sanitation / Monitoring / Planning / Case studies / Togo*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14154)

13257. **Winpenny, J.** 1994. Managing water as an economic resource. London, UK: Routledge. 133p.

*Water supply / Water demand / Decentralization / Incentives / Water policy / Performance / Economic aspects*

(Location: ODI, ODI Call No: ACG-W Record No: L 940155)

13258. **WMO.** 1994. Keeping the planet blue: The role of the world Meteorological Organization. Information Development, 10(2):72-78.

*Data collection / Water resources / Water quality*

(Location: ODI Call No: ODI Journals Record No: L 942415)

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*River basins / Hydrology / History / Water resources / Conflict / Political aspects / International cooperation / Middle East / Israel / Jordan / Palestine / Egypt / Sudan / Syria / Lebanon / Turkey / Nile River / Jordan River / Euphrates River*

(Location: HQ Call No: 333.91 GG30 BIS Record No: H 14390)

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*Water resource management / Environmental effects / Climate / River basins / Reservoirs / Simulation models / Water balance / USA / New York / Philadelphia*

(Location: HQ Call No: PER Record No: H 13767)

13261. **Woo, C.K. 1993.** Drought management, service interruption, and water pricing: Evidence from Hong Kong. *Water Resources Journal*, 178:25-30.

*Drought / Water supply / Water resource management / Water rates / Mathematical models / Water demand / Hong Kong*

(Location: HQ Call No: PER Record No: H 14041)

Abstract: Supply shortage is a common problem faced by an urban water supply system. Nonmarket programmes are often used to reduce consumption. Using monthly water consumption data collected for Hong Kong for the period 1973-1984, we estimate the effect of service interruption on per capita consumption. The findings show that this effect is statistically significant but relatively small in size. A price increase of 16-35 % could have produced the same amount of consumption reduction.

13262. **World Bank. 1993.** Gains that might be made from water conservation in the Middle East. Report prepared by staff of the World Bank, Washington, DC, in response to a request from the Multilateral Working Group on Water to the Middle East Peace Initiative. ii, 36p.

*Water conservation / Water resources / Water use / Privatization / Water loss / Canal linings / Legal aspects / Water management / Economic aspects / Middle East*

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13263. **World Bank. 1993.** Seminar on Management of International Waterways, Almaty, Kazakhstan, 11 June 1993. Papers presented at a seminar organized by the Kazakhstan Government, in connection with the visit of the Aral Sea Program Identification Mission led by the World Bank. vii, 21p. + annexes.

*Water resource management / International cooperation / Water policy / Rivers / Development aid / Financing / Legal aspects / Kazakhstan / Kyrgyzstan / Tajikistan / Turkmenistan / Uzbekistan / India / Mexico / USA*

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13264. **World Bank. 1993.** A strategy for managing water in the Middle East and North Africa. Report by staff of the Water Resource Management Unit of the ECA/MENA Technical Department in cooperation with operational staff of the MENA region. x, 44p.

*Development policy / Water resource management / Water policy / Sustainability / Development aid / Financing / Water rights / Legislation / Water supply / Environmental effects / Middle East / North Africa / Algeria/ Iran / Libya / Malta / Morocco / Tunisia / Bahrain / Egypt / Iraq / Jordan / Kuwait / Lebanon / Oman / Qatar / Saudi Arabia / Syria / United Arab Emirates / Yemen*

(Location: HQ, ICID Call No: 333.91 GG30 WOR Record No: H 13665)

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*Water resources development / Water resource management / Developing countries / Development policy / Development aid / Water users' associations*

(Location: HQ Call No: 333.91 G000 WOR Record No: H 13697)

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*Development projects / International cooperation / Water resource management / Water policy / Legal aspects / Development aid / Financing*

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*Water resources*

(Location: ICID Record No: 26266)

13268. **Zampella, R.A. 1994.** Characterization of surface water quality along a watershed disturbance gradient. *Water Resources Bulletin*, 30(4):605-611.

*Water quality / Watersheds / Surface water / Land use / USA / New Jersey*

(Location: HQ Call No: PER Record No: H 15674)

#### Rivers and streams

13269. **Andersen, R.A.; Rangeley, W.R. 1993.** Prospects for development of Sub-Saharan rivers. In Biswas, A.K.; Jellali, M.; Stout, G.E. (Eds.), *Water for sustainable development in the twenty-first century*. Delhi, India: OUP. pp.138-156.

*River basin development / Water resources / International cooperation/ Organizations / Groundwater / Irrigation / Africa South of Sahara*  
(Location: HQ Call No: 333.91 G000 BIS Record No: H 14402)

13270. **Kolars, J. 1994.** Problems of international river management: The case of the Euphrates. In Biswas, A.K. (Ed.), *International waters of the Middle East: From Euphrates-Tigris to Nile*. Bombay, India: OUP. pp.44-94.

*River basin development / Water resources / International cooperation / Middle East / Turkey / Syria / Iraq / Euphrates River / Tigris River*  
(Location: HQ Call No: 333.91 GG30 BIS Record No: H 14391)

13271. **Mageed, Y.A. 1994.** The Nile Basin: Lessons from the past. In Biswas, A.K.(Ed.), International waters of the Middle East: From Euphrates-Tigris to Nile. Bombay, India: OUP. pp.156-184.

*Water resources / History / River basin development / Water quality / Political aspects / Irrigated farming / Food production / International cooperation / Institutions / Environmental degradation / Egypt / Sudan / Kenya / Ethiopia / Tanzania / Nile River*  
(Location: HQ Call No: 333.91 GG30 BIS Record No: H 14392)

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(Location: HQ Call No: PER Record No: H 13684)

**Abstract:** This paper presents the development of a practical tool to evaluate the required width of a hydrological buffer zone, in order to maintain the effects of subsurface drainage within reasonable limits. A simple mathematical formulation describing the lateral drawdown extent of a drained water table in unsteady flow conditions was used. Simulation results were worked out by introducing the concepts of "protection level" or "threshold of tolerance" for the vegetation of the protected area. The latter are expressed in terms of an admissible drawdown combined with exceedance duration and/or frequency criteria. An application of this method to the protection of a peat bog system in the Swiss Jura region is presented.

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Abstract: This article presents the formal analysis of a problem of the optimal flood control in systems of serially connected multiple water reservoirs. It is assumed, that the basic goal is minimization of the peak flow measured at a point (cross-section) located downstream from all reservoirs and that inflows to the system are deterministic. A theorem expressing sufficient conditions of optimality for combinations of releases from the reservoirs is presented together with the relevant proof. The main features of the optimal combinations of controls are thoroughly explained. Afterwards, two methods of determining the optimal releases are presented. Finally, the results of the application of the proposed methodology to a small, four reservoir system are presented.
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*Reservoirs / Flood control / Brazil*  
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*Dams / Watersheds / Water management / Drought / Large-scale systems / Costs / India / Maharashtra / Sardar Sarovar Project / Gujarat / Kutch*  
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*Dams / Environmental effects / Sustainability / India*

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*Dam construction / Computer techniques / Computer software / Design*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14361)

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*Irrigation programs / Reservoir storage / Sedimentation / Forecasting / Pakistan*

(Location: HQ Call No: P 3541 Record No: H 14780)

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*Dams / Natural resources / River basin development / Environmental effects / Legislation / Conflict / Drought / India / Gujarat / Madhya Pradesh / Maharashtra / Narmada Project*

(Location: HQ, ODI Call No: P 3564 Record No: H 14980)

13517. **Pearce, F. 1994.** Britain's other dam scandal. New Scientist, 26 February:24-29.

*Dams / Reservoirs / Development projects / Development aid / Sri Lanka / Samanalawewa*

(Location: HQ Call No: P 3396 Record No: H 14241)

13518. **Piquemal, P.D. 1991.** Inventaire et bilan des retenues d'eau au Burkina Faso. [Inventory of the hydraulic dams in Burkina Faso] Cahiers d'Outre-Mer, 44(175):259-280.

*Dams / Water supply / Burkina Faso*

(Location: HQ Call No: P 3512 Record No: H 14668)

**Abstract:** This article is a critical evaluation of the different kinds of dams in Burkina Faso which are concentrated mainly in the Central Uplands. They

are made mostly of earth, and the projects carried out by non governmental help associations. The problem now is that they are not maintained. The dams have generally low capacity and are chiefly used for supplying households and livestock with water. Irrigation systems are not fixed targets, and they now suffer from lack of care from the local population and are not maximally used.

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*Dams / Reservoirs / Water storage / India*

(Location: HQ Call No: P 3412 Record No: H 14292)

13520. **Rausch, D.L. 1986.** Spillway design affects reservoir water quality. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.462-466;472.

*Reservoir operation / Water quality / Design / USA / Missouri*

(Location: HQ Call No: 631.4 G000 AME Record No: H 5464)

13521. **Shangle, A.K.; Singh, R.N.P. 1989.** Reservoir sedimentation survey using high technology. Journal of Indian Water Resources Society, 9(2):53-55.

*Reservoirs / Sedimentation / Siltation / Surveys / Technology / India*

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*Reservoir operation / Mathematical models / Water storage / India*

(Location: HQ Call No: P 3528 Record No: H 14753)

13523. **Thornton, J. 1994.** Mountainous control task. World Water and Environmental Engineering, June:24.

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(Location: HQ Call No: PER Record No: H 15111)

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*Dams / Reservoirs / Water resources / Environmental effects / Egypt / Nile River*

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*Dams / Reservoirs / Environmental effects / Rivers / Siltation / Erosion / Water quality / Ecosystems / Public health / Schistosomiasis / Social aspects / Egypt / Nile River*

(Location: HQ Call No: P 3282 Record No: H 13796)

13526. **University of Michigan. Division of Research Development and Administration.** 1980. Beyond Aswan. The Research News. University of Michigan. Division of Research Development and Administration, 31(7):27-29.

*Irrigation programs / Policy / Dams / Reservoirs / River basins / International cooperation / Sudan / Egypt / Nile River*

(Location: HQ Call No: P 3282 Record No: H 13797)

13527. **Vasiliadis, H.V.; Karamouz, M.** 1994. Demand-driven operation of reservoirs using uncertainty-based optimal operating policies. Journal of Water Resources Planning and Management, 120(1):101-114.

*Reservoir operation / Stochastic process / Simulation models / Operating policies / Water demand / Statistical analysis*

(Location: HQ Call No: PER Record No: H 13772)

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*Dams / Water supply / Hydroelectric schemes / Population*

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13529. **Wood, J.R.** 1993. India's Narmada River dams: Sardar Sarovar under siege. Asian Survey, 33(10):968-984.

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*Reservoirs / Rivers / Simulation models / Flow control / Computer models / Computer techniques / Optimization / Case studies / Water rights*

(Location: HQ, ODI Call No: PER Record No: H 14793)

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*Environment / Technology*

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#### Water supply

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*Water supply / Rural development / Villages / Economic aspects / Households / Water lifting / Water scarcity / Tube wells / Water costs / Water policy / Social aspects / Bureaucracy / India*

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*Water supply / Sanitation / Development projects / Developing countries*

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*Water supply / Sanitation / Water management / Rural development / Water policy*

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*Water pollution / Water resources / Rivers / USA*

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*Water distribution / Pumping / Pipes / Water demand / Rehabilitation / Maintenance / Mathematical models / Costs*

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*Water supply / Sanitation / Research / Rural development / Manual pumps*

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*Water supply / Pumping / Hydraulics / Simulation models / Networks / Optimization*

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*Water pollution / Water resources / Groundwater*  
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*Water supply / Water use / Water rates / USA*  
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*Water quality / Data collection / Computer software / Computer techniques / Data storage and retrieval / USA*

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*Water supply / Sanitation / Public health / Developing countries / Sustainability / Policy / Non-governmental organizations / Private sector*

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*Water supply / Sanitation / Water management / Monitoring / Rural development*

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*Water supply / Households / Developing countries / Economic aspects / Economic analysis / Water demand / Mathematical models / Investment planning*

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*Water supply / Water demand / Water policy / Villages / Households / Developing countries / Rural sociology / Latin America / Africa / South Asia*

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*Rainfall-runoff relationships / Water harvesting / Water conservation / Jordan / Greater Amman*

(Location: HQ Call No: PER Record No: H 15008)

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*Water harvesting / Rain / Surface runoff / Arid zones / Mathematical models / Developing countries / Irrigation design / Catchment areas / Soil water / Calibrations / Water balance / Niger / Nigeria*

(Location: HQ Call No: 628.14 G000 BOE  
Record No: H 14828)

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13551. **Cartwright, A. (Ed.) 1993.** World agriculture 1994. London, UK: Sterling Publications. 144p.

*Agricultural production / Crop production / Horticulture / Technology / Irrigation equipment / Waste waters / Rice / Vectors / Human diseases / Agricultural economics*

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13552. **Chopra, K. 1990.** Agricultural development in Punjab: Issues in resource use and sustainability. New Delhi, India: Vikas Publishing House. 154p.

*Agricultural development / Sustainability / Resource management / India / Punjab*

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*Agricultural economics / Management / Models / Environment / Economic aspects / Agricultural planning / Linear programming / Simulation / Control systems / Forecasting*

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*Agricultural production / Food production / Statistics / Marketing / Prices / Production costs / India*

(Location: HQ Call No: 630.212 G635 BAN  
Record No: H 13871)

13556. **Bansil, P.C. 1990.** Agricultural statistical compendium. Vol.1 - Foodgrains. Part I. New Delhi, India: Techno Economic Research Institute. pp.xxii, 1-581.

*Agricultural production / Food production / Statistics / Economic aspects / Employment / Education / Rain / Water resources / Land use / Land resources / Irrigation / Crop yield / India*

(Location: HQ Call No: 630.212 G635 BAN  
Record No: H 13870)

### Agricultural meteorology

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*Agroclimatology / Agriculture / Climate*

(Location: HQ Call No: 630.2515 G000 WMO  
Record No: H 14091)

13558. **Wolff, P. 1988.** Entwicklungstendenzen in der agrarmeteorologie aus der sicht eines kulturtechnikern. [Tendency in the development of agricultural meteorology: A soil and water engineers view] Kulturtechnik und Flurbereinigung, 29:226-233.

*Land use / Agriculture / Environment / Climate*

(Location: HQ Call No: P 3382 Record No: H 14198)

**Abstract:** An analysis of the global tendency in land use is made and from the results of this analysis conclusions are drawn in respect to the future developments in agricultural meteorology. There will be an overall increasing demand for observations of the physical and biological elements in the environment. These observations will be carried out to an increasing extent by non-meteorologists which has to be considered in the construction and sale of meteorological instruments.

### Agricultural extension

13559. **Boehnert, J. 1993.** Integrated watershed management and agroforestry in agricultural extension with a reference to the Dominican Republic. Dissertation prepared in partial fulfilment of the requirements for the MSc in Agricultural Extension, Agricultural Extension and Rural Development Department, Reading University. 128p.

*Watershed management / Agricultural extension / Agroforestry / Farmer participation / Dominican Republic*

(Location: ODI Call No: F 1515. RRMG Record No: L F 1515)

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*Agricultural research / Agricultural extension / Farmers' attitudes / Sustainable agriculture*

(Location: HQ Call No: 630.715 G000 IIE Record No: H 13888)

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*Agricultural research / Agricultural extension / Farmers' attitudes / Farmer participation / Rice / Pest control / Watershed management / Sustainable agriculture / Villages / Asia / Philippines / Nepal / India / Indonesia*

(Location: HQ Call No: 630.715 G000 IIE Record No: H 13890)

13562. **IIED. Sustainable Agriculture Programme. 1994.** RRA notes number 19: Special issue on training. London, UK: IIED. 121p.

*Training / Rural development / Participatory rural appraisal / Health / Women / Gender / Agricultural policy / Villages / Evaluation / India / UK / USA / Uganda / Ethiopia / Bangladesh / Sudan / Tanzania / Kenya / Brazil*

(Location: HQ Call No: 630.715 G000 IIE Record No: H 14029)

13563. **King, J.W.; Francis, C.A. (Eds.) 1994.** Extension and education materials for sustainable agriculture: A project of the North Central Region Sustainable Agricultural Research and Education and Agriculture in Concert with the Environment. Lincoln, NE, USA: University of Nebraska a. Center for Sustainable Agricultural Systems. 2 vols.; pp.1-212; 213-390.

*Agricultural extension / Agricultural research / Teaching materials / Education / Sustainable agriculture / Environmental sustainability*

(Location: HQ Call No: 630.715 G000 KIN Record No: H 14852)

13564. **Mata, J.I. 1992.** CTAA method for transferring technology to farmers: Planning and implementation guide. Washington DC, USA: Academy for Educational Development. xvi, 259p.

*Agricultural extension / Agricultural research / Technology transfer / Farmers / Communication / Data collection / Training*

(Location: HQ Call No: 630.715 G000 MAT Record No: H 14831)

13565. **Pretty, J.N.; Chambers, R. 1993.** Towards a learning paradigm: New professionalism and institutions for agriculture. Brighton, UK: IDS. iv, 68p. (IDS discussion paper 334)

*Agricultural extension / Agricultural research / Institutions / Agricultural development / Non-governmental organizations / Education*

(Location: HQ Call No: 630.715 G000 PRE Record No: H 14093)

**Abstract:** An earlier version of this paper was presented at the IIED/IDS Beyond farmer first: Rural people's knowledge, agricultural research

and extension practice workshop, IDS, University of Essex, UK, 27-29 October 1992.

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*Agricultural extension / Sustainable agriculture / Agricultural development / Technology transfer / Traditional farming / Farmer participation / India*

(Location: HQ Call No: P 3418 Record No: H 14319)

13567. **Rambo, A.T.; Chantalakhana, C.; Seetisarn, M. 1986.** Mid-term evaluation report: Farming Systems Research Sub-Project. Khon Kaen University Research Development Project. (USAID Project No.493-0322), 13 January - 8 February 1986. xxix, 96p.

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(Location: HQ Call No: P 3317 Record No: H 13970)

13568. **Scoones, I.; Thompson, J. 1993.** Beyond farmer first - Rural people's knowledge, agricultural research and extension practice: Towards a theoretical framework. In IIED, Rural people's knowledge, agricultural research and extension practice: Overview papers. London, UK: IIED. pp.1-20.

*Agricultural research / Agricultural extension / Farmers' attitudes / Sustainable agriculture / Community development / Rural development / Farmer participation*

(Location: HQ Call No: 630.715 G000 IIE Record No: H 13889)

13569. **Thomas, G. 1994.** Mahasahana: The "great benefit" network. *Ceres*, 145:26-31.

*Farmers' associations / Farmers' attitudes / Agricultural extension / Sri Lanka*

(Location: HQ Call No: P 3328 Record No: H 14011)

13570. **WARDA. 1993.** Human resources development for rice science in West Africa: Strengthening West Africa's capability in the science, technology and socio-economics of rice production. Proceedings of a WARDA/NARS Training Seminar held at WARDA, Bouaké, Côte d'Ivoire, 4-6 May 1992. Bouaké, Côte d'Ivoire: WARDA. vii, 152p.

*Agricultural extension / Training needs assessment / Human resource development / Rice / Teaching materials / Education / Evaluation / West Africa / Niger / Nigeria / Gambia*

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**Agricultural research**

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Record No: H 15524)

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*Agricultural research / Agricultural development / Political aspects / Food production / Agricultural labor / Farmers / Sudan*  
(Location: HQ Call No: P 3574 Record No: H 15158)

13573. **Bilney, G. 1994.** Benefits to Australia from international agricultural research. In Lawrence, J. (Ed.), *A profit in our own country*: Record of a seminar conducted by the Crawford Fund for International Agricultural Research, Parliament House, Canberra, May 17 1994. Canberra, Australia: ACIAR. pp.5-11.

*Agricultural research / Agricultural production / Development aid / Australia*  
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Record No: H 15522)

13574. **Bonte-Friedheim, C; Tabor, S.R.; Roseboom, J. 1994.** Financing national agricultural research: The challenge ahead. *ISNAR Briefing Paper*, No.11:6p.

*Agricultural research / Research policy / Financing / Developing countries*  
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13575. **Bonte-Friedheim, C. 1994.** The future of agricultural research hangs on the balance: Has the CGIAR or ISNAR failed? *ISNAR Newsletter*, 24:2,8.

*Agricultural research / Policy / Research priorities*  
(Location: HQ Call No: P 3416 Record No: H 14300)

13576. **Busch, L.; Bingen, R.J. 1994.** Restructuring agricultural research: Some lessons from experience. *ISNAR Briefing Paper*, No.13:5p.

*Agricultural research / Research institutes / Organizational development*  
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13577. **CGIAR. 1994.** Challenging hunger: The role of the CGIAR. Washington, DC, USA: CGIAR. 42p.

*Agricultural research / Sustainable agriculture / Research institutes / Agricultural development /*

*Research priorities / Food production / International cooperation*

(Location: HQ Call No: 630.72 G000 CGI Record No: H 13983)

13578. **CGIAR. TAC. 1990.** A possible expansion of the CGIAR. Report presenting TAC's recommendations on the possible expansion of the CGIAR, September 1990. xvi, 200p. + annexes.

*Agricultural research / Research policy / Research institutes / Asia / Pacific Islands / Africa South of Sahara / Latin America / Caribbean / West Asia / North Africa*  
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*Human resource development / Training / Research institutes / Agricultural research*  
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13580. **Collinson, M.P.; Tollens, E. 1994.** The impact of the international agricultural research centers: Measurement, quantification, and interpretation. Washington, DC, USA: CGIAR. iii, 41p. (Issues in agriculture 6)

*Research institutes / Agricultural research*  
(Location: HQ Call No: P 3662 Record No: H 15603)

13581. **Constable, D. 1994.** Water rights - And wrongs. In Lawrence, J. (Ed.), *A profit in our own country*: Record of a seminar conducted by the Crawford Fund for International Agricultural Research, Parliament House, Canberra, May 17 1994. Canberra, Australia: ACIAR. pp.121-127.

*Water rights / Irrigated farming / Water resource management / Australia*  
(Location: HQ Call No: 630.72 G922 LAW  
Record No: H 15527)

13582. **Dillon, J.L. 1994.** The range of benefits. In Lawrence, J. (Ed.), *A profit in our own country*: Record of a seminar conducted by the Crawford Fund for International Agricultural Research, Parliament House, Canberra, May 17 1994. Canberra, Australia: ACIAR. pp.13-20.

*Agricultural research / Development aid / Australia*  
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Record No: H 15523)

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*Agricultural research / Agricultural development / Australia*

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Record No: H 15525)

13584. **Farrington, J.; Bebbington, A. 1994.** From research to innovation: Getting the most from interaction with NGOs in farming systems research and extension. London, UK: IIED. 23p. (Gatekeeper series no.43)

*Agricultural research / Farmers' associations / Non-governmental organizations / Agricultural extension / Public sector / Private sector / Technology*

(Location: HQ Call No: 630.72 G000 FAR  
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13585. **Fujisaka, S. 1994.** Will farmer participatory research survive in the international agricultural research centres? London, UK: IIED. 16p. (Gatekeeper series no.44)

*Agricultural research / Research institutes / Farmer participation / Rice*

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13586. **Gilbert, E.; Matlon, P.; Eyzaguirre, P. 1994.** New perspectives for vulnerable institutions: Agricultural research systems in the small countries of West Africa. IS-NAR briefing paper, 14:1-8.

*Agricultural research / Research institutes / Developing countries / West Africa / Benin / Cape Verde / Chad / Gambia / Guinea Bissau / Liberia / Mauritania / Sierra Leone / Togo*

(Location: HQ Call No: P 3614 Record No: H 15402)

13587. **Gowda, C.L.L.; van Santen, C.E.; Johansen, C.; Nigam, S.N. (Eds.) 1993.** Approaches to on-farm research in Asia: Summary proceedings of the Regional Workshop on On-farm Adaptive Research, Ho Chi Minh City, Vietnam, 18-20 February 1993. Patancheru, AP, India: ICRI-SAT. 149p.

*On farm research / Farmer participation / Agricultural extension / Agricultural research / Case studies / Asia / Indonesia / Nepal / Sri Lanka / Vietnam / Bangladesh / China / Korea Republic / Laos / Myanmar / Pakistan / Philippines / Thailand*

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Record No: H 14000)

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*Agricultural research / Research institutes / Agricultural production / Food production / Food policy / India*

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*Agricultural research / Agricultural production / Research institutes / Food production / Food policy / Farming systems / Indonesia*

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*Agricultural research / Research institutes / Agricultural production / Food production / Food policy / Madagascar*

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*Agricultural research / Agricultural production / Research institutes / Food production / Food policy / Farming systems / Rwanda*

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*Agricultural research / Research institutes / Agricultural production / Food production / Food policy / Saudi Arabia*

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(Location: HQ Call No: IIMI 630.72 G744 KAR Record No: H 15162)

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*Agricultural research / Financing / Agricultural development / Development aid / Water rights / Sustainable agriculture / Australia*

(Location: HQ Call No: 630.72 G922 LAW Record No: H 15521)

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*Agricultural research / Research policy / Research institutes / Development aid*

(Location: HQ Call No: 630.72 G000 LUN Record No: H 14544)

13608. **Maclean, J.; Janagap, C. 1993.** The publication productivity of International Agricultural Research Centers. Scientometrics, 28(3):329-348.

*Agricultural research / Research institutes / Documentation / Information services*

(Location: HQ Call No: P 3379 Record No: H 14195)

**Abstract:** The literature output over one year, 1990, of 22 International Agricultural Research Centers (IARCs), including 16 CGIAR centers, was examined. Total output of the IARCs was 1,694 items, of which on average 42% were primary (refereed) literature, 24% were reports and monographs; 18% proceedings papers; 8% book chapters; and 8% semitechnical/popular literature. Total literature production from the IARCs is similar in magnitude to that of FAO. There were 1,230 internationally recruited scientists in the IARCs, with an average annual productivity of 1.38 items per scientist, including 0.58 primary literature articles. There was no correlation between scientific productivity and numbers of scientists in a center. However, there was a significant positive correlation between scientific productivity and center budget, indicating higher efficiency in the larger centers. In view of the nature of IARCs' literature output, we argue that IARCs should reject the trend for scientists to be assessed only by citations in "core" primary literature; and that IARCs should set up an international standard, perhaps based on the present proportionality of types of their literature output in order to assess IARC individual scientists and the "health" of their institutional output.

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*Rice / Wheat / Agricultural research / Farming systems / Pakistan / Punjab*

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*Research priorities / Agricultural research / Developing countries / Case studies / Irrigation / Priority setting / UK*

(Location: HQ Call No: PER Record No: H 14493)

13616. **Tamil Nadu Agricultural University; IIED. 1992.** Participatory rural appraisal (PRA) for agricultural research at Aruppukottai and Paiyur, Tamil Nadu. Coimbatore, India: TNAU. 234p.

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13627. **Bajracharya, B. 1994.** Gender issues in Nepali agriculture: A review. Kathmandu, Nepal: HMG Ministry of Agriculture. iii, 78p. (Research report series no.25)

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(Location: ODI Call No: ODI Journals Record No: L 941585)

13639. **Regmi, S.K. 1992.** Women's involvement in rice farming enterprise in Bara District, Nepal: A comparative ethnic and gender-related study. Thesis submitted to the Institute of Graduate Studies, Central Luzon State University, Munoz, Nueva Ecija, Philippines, in partial fulfillment of the requirements for the degree of Doctor of Philosophy (Rural Development) xv, 151p.

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*Women in development / Female labor / Agricultural extension / Agricultural manpower / Employment / India*

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13641. **Setty, E.D. 1985.** Report on the AIT-ESCAP Workshop on Identification of Appropriate Technologies and Methods of Technology Transfer for Rural Women. In Report of the Project Design Workshop on Women in Rice Farming Systems, IRRI, Los Baños, Laguna, Philippines, 10-13 April 1985. pp.27-31.

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13642. **Sharma, K.K. 1994.** Training farm women in home science. *Indian Farming*, March:24-30.

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### Specific techniques

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(Location: ODI Call No: R-RPRRP WP no. 14 Record No: L 940723)

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(Location: HQ Call No: 631.4 G000 AME Record No: H 13848)

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(Location: HQ Call No: 631.4 G000 GRE Record No: H 14263)

**Abstract:** A position paper prepared under the auspices of ACIAR; French Ministry of Foreign Affairs; ODA; Swiss Development Cooperation; USAID, at The International Board for Soil Research and Management, Bangkok.

13666. **Harris, D.; Fry, G.J.; Miller, S.T. 1994.** Microtopography and agriculture in semi-arid Botswana: 2. Moisture availability, fertility and crop performance. *Agricultural Water Management*, 26(1/2):133-148.

*Soil moisture / Runoff / Arid zones / Crop yield / Soil fertility / Botswana*

(Location: HQ Call No: PER Record No: H 15484)

13667. Hwang, S.W.; Alwang, J.; Norton, G.W. 1994. Soil conservation practices and farm income in the Dominican Republic. *Agricultural Systems*, 46(1):59-77.

*Soil conservation / Farm income / Farm management / Agricultural policy / Erosion / Decision support tools / Models / Dominican Republic*

(Location: HQ Call No: PER Record No: H 14687)

13668. Kanté, S.; Defoer, T. 1994. How farmers classify and manage their land: Implications for research and development activities. London, UK: IIED. iii, 17p. (Dryland Networks Programme issue paper no.51)

*Soil classification / Land classification / Soil conservation / Traditional farming / Tillage / Land use / Crop yield / Mali*

(Location: HQ Call No: P 3612 Record No: H 15310)

13669. Kohyama, K.; Subhasaram, T. 1993. Salt-affected soils in northeast Thailand: Their salinization and amelioration. Khon Kaen, Thailand: Agricultural Development Research Center. 55p. (Technical paper no.12)

*Soil salinity / Salinity control / Watersheds / Thailand*

(Location: HQ Call No: 631.4 G750 KOH Record No: H 14591)

13670. Martinez-Catroviejo. 1990. Bed loan size distribution and flow conditions in a high mountain catchment of Central Pyrenees. *Pirineos*, No.135 January-June:39-53.

*Mountains / Rain / Eroded soils / Ecology / Water / Europe / Pyrenees*

(Location: ODI Call No: ODI Journals Record No: L 942342)

13671. McKenzie, D.C.; Abbott, T.S.; Chan, K.Y.; Slavich, P.G.; Hall, D.J.M. 1993. The nature, distribution and management of sodic soils in New South Wales. *Australian Journal of Soil Research*, 31:839-868.

*Sodic soils / Clay soils / Soil properties / Soil management / Irrigation / Australia / New South Wales*

(Location: HQ Call No: P 3319 Record No: H 13994)

13672. Miller, S.T.; Brinn, P.J.; Fry, G.J.; Harris, D. 1994. Microtopography and agriculture in semi-arid Botswana: I. Soil variability. *Agricultural Water Management*, 26(1/2):107-131.

*Soil properties / Soil moisture / Runoff / Arid zones / Mapping / Satellite surveys / Botswana*

(Location: HQ Call No: PER Record No: H 15483)

13673. Müller, L.; Schindler, U. 1993. Studies in the water regime and land use of heavy lowland soils. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1111-1122.

*Soil properties / Land use / Soil water relations / Germany*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15343)

13674. Mulongoy, K.; Merckx, R. (Eds.) 1993. Soil organic matter dynamics and sustainability of tropical agriculture: Proceedings of an International Symposium organized by the Laboratory of Soil Fertility and Soil Biology, Katholieke Universiteit Leuven (K.U. Leuven) and IITA and held in Leuven, Belgium, 4-6 November 1991. Chichester, UK: John Wiley and Sons. xiii, 392p.

*Sustainable agriculture / Soil structure / Soil management / Small farms / Nigeria / Burkina Faso / Sri Lanka / Zaire / Thailand / Tunisia / Zimbabwe / Sweden / Mexico / Zambia*

(Location: HQ Call No: 631.4 G000 MUL Record No: H 13780)

13675. Nehrendt, H.; Boekhold, A. 1993. Phosphorus saturation in soils and groundwaters. *Land Degradation & Rehabilitation*, 4(4):233-243.

*Pollution / Groundwater / Soil degradation / Agriculture / Europe*

(Location: ODI Call No: ODI Journals Record No: L 941327)

13676. Ritzema, H.P.; Kselik, R.A.L.; Subagyo, K. 1993. Water-management strategies to ameliorate and use acid sulphate soils in the humid tropics. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1219-1235.

*Soil properties / Water management / Soil fertility / Drainage / Rice / Water conservation / Indonesia / Netherlands*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15350)

13677. Schwab, G.O.; Frevert, R.K.; Edminster, T.W.; Barnes, K.K. 1981. Soil and water conservation engineering. New York, NY, USA: John Wiley & Sons. xv, 525p.

*Soil conservation / Water conservation / Precipitation / Infiltration / Evapotranspiration / Runoff / Erosion / Surface drainage / Open channels / Subsurface drainage / Water supply / Water quality / Surface irrigation / Sprinkler irrigation / Drip irrigation / Velocity / Irrigation design*

(Location: HQ Call No: 631.4 G000 SOI Record No: H 14078)

13678. **So, H.B.; Aylmore, L.A.G. 1993.** How do sodic soils behave? The effects of sodicity on soil physical behaviour. *Australian Journal of Soil Research*, 31:761-777.

*Sodic soils / Soil properties*

(Location: HQ Call No: P 3407 Record No: H 14532)

13679. **Sumanaratne, H.D.; Somasiri, S. 1990.** Runoff generation and soil erosion under three different land uses in the dry zone of Sri Lanka. *Tropical Agriculturist*, 146:1-9.

*Soils / Erosion / Runoff / Land use / Arid zones / Catchment areas / Sri Lanka*

(Location: HQ Call No: P 3389 Record No: H 14205)

13680. **Tamang, D. 1993.** Living in a fragile ecosystem: Indigenous soil management in the hills of Nepal. London, UK: IIED. 23p. (Gatekeeper series no.41)

*Ecology / Mountains / Soil conservation / Fertilizers / Labor / Farmers / Nepal*

(Location: HQ Call No: 631.4 726 TAM Record No: H 13778)

13681. **Vlaar, J.C.J. (Ed.) 1992.** Les techniques de conservation des eaux et des sols dans les pays du Sahel. Ouagadougou, Burkian Faso; Wageningen, The Netherlands: Comité Interfrancan d'Études Hydrauliques; Université Agronomique Wageningen. iv, 99p. + annexes.

*Agricultural research / Water conservation / Erosion / Environmental effects / Climate / Natural resources / Geomorphology / Sahel*

(Location: HQ Call No: 631.4 G152 VLA Record No: H 14324)

13682. **Vlaar, J.C.J. 1993.** Techniques de conservation des eaux et des sols au Sahel. Bulletin de Liaison du Comité Interfrancan d'Études Hydrauliques, No.94:29-48.

*Soil conservation / Water conservation / Case studies / Burkina Faso / Mali / Niger / Sahel*

(Location: HQ Call No: P 3294 Record No: H 13896)

**Abstract:** Soils of the Sahelian region, in the broad sense, between 200 and 1200 mm of annual rainfall, are overexploited and therefore degraded. Soil and water conservation measures have to be taken against this degradation. These measures can consist in soil tillage, implementation of permanent structures or use of vegetation. From the experience of earlier or on-going implementation and research, the most commonly applied techniques in the Sahel are described and compared with regard to: The climate, soil and topography to which they can be applied; their impact on agricultural yields and erosion control; their costs; materials and labor needed for construction; specific bottle necks for construction: know-how, equipment, organization, etc. Constraints related to the implementation, the

maintenance and the replicability of the soil and water conservation devices are considered from a general point of view: support coming from the projects, importance of the intensification of the farming system, development and management of village territory.

13683. **Wade, M.K.; Gill, D.W.; Subagio, H.; Sudjadi, M.; Sanchez, P.A. 1988.** Overcoming soil fertility constraints in a transmigration area of Indonesia. Raleigh, NC, USA: North Carolina State University. iv, 60p. (TropSoils bulletin no.88-01)

*Soil management / Soil fertility / Fertilizers / Land reclamation / Indonesia*

(Location: HQ Call No: P 1942 Record No: H 14537)

13684. **Wopereis, M.; Kropff, M.; Bouma, J.; van Wijk, A.; Woodhead, T. (Eds.) 1994.** Soil physical properties: Measurement and use in rice-based cropping systems. Los Banos, Laguna, Philippines: IRRRI. iv, 111p.

*Rice / Soil properties / Hydraulics / Soil moisture / Soil structure / Cropping systems / Measuring instruments / Monitoring / Soil water relations*

(Location: HQ Call No: 631.4 G000 WOP Record No: H 14542)

#### Soil erosion and its control

13685. **Mati, B.M. 1994.** Splash transport of soil on a slope under various crop covers. *Agricultural Water Management*, 26(1/2):59-66.

*Soil conservation / Erosion / Soil management / Rain / Kenya*

(Location: HQ Call No: PER Record No: H 15479)

13686. **Walling, D.E.; Yair, A.; Berkowicz, S. (Eds.) 1990.** Erosion, transport and deposition processes. Wallingford, UK: IAHS. vii, 203p. (IAHS publication no.189)

*Erosion / Sedimentation / Simulation models / Runoff / Rain / Field tests / Reservoirs / Germany / Hungary / USA*

(Location: HQ Call No: 631.45 G000 WAL Record No: H 14490)

**Abstract:** Proceedings of a workshop held at Jerusalem, Israel, March-April 1987. The workshop was organized jointly by the International Commission on Continental Erosion of the IAHS and the Commission on Measurement, Theory and Application in Geomorphology (COMTAG) of the International Geographical Union (IGU).

#### Drainage

13687. **Balodis, E.; Juskauskas, J.; Morkunas, V. 1993.** Subsurface drainage in polders in Lithuania. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993. Water management in the next

century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1315-1319.

*Subsurface drainage / Surface water / Mathematical models / Lithuania*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15357)

13688. **Darwish, A.; Fakir, A.; Menting, G. 1993.** Drainage design analyses of large scale areas. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.735-742.

*Drainage / Design / Computer techniques / Computer software / Egypt / Fayoum*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15241)

13689. **Easa, S.M. 1994.** Reliability analysis of open drainage channels under multiple failure modes. Journal of Irrigation and Drainage Engineering, 120(6):1007-1024.

*Drainage / Open channels / Design / Performance / Simulation / Reliability*

(Location: HQ Call No: PER Record No: H 15679)

13690. **Fipps, G.; Skaggs, R.W. 1986.** Effect of canal seepage on drainage to parallel drains. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.1278-1283.

*Canals / Seepage / Drainage / Water table / Infiltration / Soils / Mathematical models / Simulation / Field tests*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13860)

13691. **Gallichand, J. 1994.** Numerical simulations of steady-state subsurface drainage with vertically decreasing hydraulic conductivity. Irrigation and Drainage Systems, 8(1):1-12.

*Subsurface drainage / Hydraulics / Water table / Simulation*

(Location: HQ Call No: PER Record No: H 15508)

13692. **Garbrecht, J.; Martz, L.W. 1993.** Network and subwatershed parameters extracted from digital elevation models: The Bills Creek experience. Water Resources Bulletin, 29(6):909-916.

*Drainage / Networks / Watersheds / Computer models / USA / Oklahoma*

(Location: HQ Call No: PER Record No: H 14503)

13693. **Jingxuan, S. 1993.** The mole drainage of farming land in China. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions:

Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1105-1109.

*Drainage / Soil properties / Wheat / Rice / Groundwater / China*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15342)

13694. **Jurczuk, S. 1993.** Drainage effects of Gytja-muck soil. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.988-996.

*Drainage / Soil properties / Soil moisture / Water balance / Poland*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15332)

13695. **Kanwar, R.S.; Colvin, T.S.; Melvin, S.W. 1986.** Comparison of trenchless drain plow and trench methods of drainage installation. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.456-461.

*Subsurface drainage / Performance evaluation / Crop yield / Water table / Maize / Soyabeans / Drains / Field tests / USA*

(Location: HQ Call No: 631.4 G000 AME Record No: H 5462)

13696. **Kumar, S.; Gupta, S.K.; Ram, S. 1994.** Inverse techniques for estimating transmissivity and drainable pore space utilizing data from subsurface drainage experiments. Agricultural Water Management, 26(1+2):41-58.

*Subsurface drainage / Mathematical models / Computer techniques / Simulation / Water table / Soil texture / India*

(Location: HQ Call No: PER Record No: H 15478)

13697. **Lorre, E.; Lesaffre, B.; Skaggs, R.W. 1994.** Comparison of models for subsurface drainage in flat and sloping lands. Journal of Irrigation and Drainage Engineering, 120(2):266-277.

*Subsurface drainage / Mathematical models / Land / Simulation*

(Location: HQ Call No: PER Record No: H 14094)

13698. **Lorre, E.; LeSaffre, B. 1994.** Subsurface drainage simulation models: A world-wide survey. ICID Bulletin, 43(1):53-78.

*Subsurface drainage / Simulation models / Water table*

(Location: HQ Call No: PER Record No: H 15641)

13699. **Martz, L.W.; Garbrecht, J. 1993.** Automated extraction of drainage network and watershed data from

digital elevation models. Water Resources Bulletin, 29(6):901-908.

*Drainage / Networks / Computer models / Watershed management / USA*

(Location: HQ Call No: PER Record No: H 14502)

13700. Palacios-Vélez, O.; Bucio-Alanís, L.; Nájera-Hernández, F.; Melo-Alvarado, J. 1993. Design for a multiple door control structure on a drainage ditch. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.789-796.

*Drainage / Control methods / Design criteria / Water demand / Water table / Crop yield / Sugarcane / Mexico*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15245)

13701. Quast, J.; Dannowski, R.; Balla, D. 1993. Improved calculation methods and new technical solutions for subsurface controlled drainage systems. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century. Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1135-1150.

*Subsurface drainage / Design / Models / Siltation / Drains / Germany*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15345)

13702. Schultz, B. 1993. Design and construction of water management facilities in drainage areas. In Zakaria, S. (Ed.), Agricultural drainage: Proceedings of the National Conference on Agricultural Drainage, Melaka, Malaysia, 9-12 February 1993. Melaka, Malaysia: MANCID. pp.4.1-4.29.

*Water management / Drainage / Design / Construction / Maintenance*

(Location: HQ Call No: 631.62 G714 ZAK Record No: H 14718)

13703. Songgao, X.; Jianqing, G. 1993. Unsteady flow of interior drainage in stratified soil. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century. Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1097-1103.

*Drainage / Soil properties / Seepage / Infiltration / Groundwater / Water table*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15341)

13704. Tsuk, T.; Ayalon, E. 1993. Poleg and Herzliya: Two ancient drainage systems in Israel. In ICID, 15th International Congress on Irrigation and Drainage, The

Hague, Netherlands, 1993: Water management in the next century. Transactions: Vol.1-I: History special session. R.11. New Delhi, India: ICID. pp.159-173.

*Drainage / Swamps / History / Israel*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15743)

13705. van Zeijts, T.; Bons, A. 1993. Effects of jet flushing on drain performance and sustainability. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.437-450.

*Subsurface drainage / Pipes / Sedimentation / Performance / Netherlands*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15094)

13706. Yuyama, Y. 1992. Regional drainage analysis by mathematical model simulation. Paper presented at IIMI Seminar, Colombo, Sri Lanka, October 1992. 95p.

*Drainage / Mathematical models / Simulation models / Water management / Flood water / Flood control / River basins / Rain / Japan*

(Location: HQ Call No: IIMI 631.62 G696 YUY Record No: H 14853)

13707. Zakaria, S. (Ed.) 1993. Agricultural drainage: Proceedings of the National Conference on Agricultural Drainage, Persidangan Kebangsaan Saliran Pertanian, Melaka, Malaysia, 9-12 February 1993. Melaka, Malaysia: Malaysian National Committee on Irrigation and Drainage (MANCID) v.p.

*Drainage / Environment / Water management / Agricultural planning / Water resources development / Remote sensing / Case studies / Malaysia / Indonesia*

(Location: HQ, ICID Call No: 631.62 G714 ZAK Record No: H 14712)

## IRRIGATION MANAGEMENT

### General and miscellaneous

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*Irrigation systems*

(Location: ODI Call No: ODI Journals Record No: L 942327)

13709. Akio, T. 1994. Irrigation and agriculture in Myanmar: A case study of Kyaukse District. In Orii, K. (Ed.), Trial research report on a comparative study of irrigation institutions in Asia. Saitama-Ken, Japan: Daito Bunka University. pp.135-141.

*Irrigation systems / Canal irrigation / Case studies / History / Myanmar*

(Location: HQ Call No: P 3347 Record No: H 14328)

13710. **Belal, A.E. 1993.** Sustainable development in Wadi Allagi in Egypt. *Desertification Control Bulletin*, 23:39-43.

*Sustainability / Wadi / Irrigation systems / Egypt / Wadi Allagi*

(Location: ODI Call No: ODI Journals Record No: L 940633)

13711. **Bhutta, M.N.; Vlotman, W.F.; Zuberi, F.A.; Moghal, M.A.; Sufi, A.B. 1993.** Applied drainage and irrigation research at IWASRI, Pakistan. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.951-963.

*Irrigation practices / Drainage / Research / Salinity / Waterlogging / Water balance / Water table / Research institutes / Pakistan*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15328)

13712. **Bourla, F.R. 1993.** Historique et evolution institutionnelle du systeme Neste. [Institutional history and development of the "Canal de la Neste"] ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.167-180.

*Irrigation canals / History / Economic aspects / France*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15619)

13713. **Bouwer, H. 1993.** Resolving competition between urban and agricultural water use. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century: Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1429-1437.

*Water reuse / Effluents / Waste waters / Water quality / Water conservation / Groundwater / Water market / USA*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15487)

13714. **Cesarini, G. 1993.** Learning from the past: Irrigation - then and now. *Journal of Rural Cooperation*, 21(1):7-16.

*Irrigation systems / History / Water use*

(Location: HQ Call No: P 3330 Record No: H 14013)

**Abstract:** As shown by a rich iconography most of the ancient big irrigation schemes have now

disappeared. This is also true for many schemes of recent implementation. On the contrary, small irrigation devices in arid and semi-arid regions dating back to the same periods are still in use. In sub-Saharan Africa, millions of farmers fill up the long dry season by watering their fields from a handdug well exactly as farmers did in the Sudanese Nubia 3500 years ago. This phenomenon conveys an important message: this kind of small irrigation has a wide-spread effect beyond the watered fields as a supplement to rainfed agriculture. It proves that real water storage is underground. The paradox lies in our tendency to override this reality by imposing quick solutions, external high investments and resources based on industrial technology and oil, as the author calls the "Ptolemaic approach".

13715. **Chinese Hydraulic Engineering Society; CNCID. 1991.** A concise history of irrigation in China. Beijing, China: CNCID. 142p.

*Irrigation canals / Large-scale systems / Reservoirs / Groundwater irrigation / Drainage / River basins / Hydrology / Water lifting / Water law / Water conservation / Soil conservation / Waterlogging / Pumping / Irrigation management / History / China*

(Location: HQ Call No: 631.7 G592 CHI Record No: H 15031)

13716. **Dhawan, B.D. 1994.** Irrigation in India's agricultural development: Productivity, stability, equity. New Delhi, India: Commonwealth Publishers. 283p.

*Agricultural development / Irrigation / Productivity / Equity / India*

(Location: ICID Record No: 25962)

13717. **Do Hong, P. 1993.** Overview of irrigation and agriculture development in the lower Mekong Basin. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-G, Special session - Irrigation and drainage in competition for water. New Delhi, India: ICID. pp.177-200.

*Water control / Constraints / International cooperation / River basins / Climate / Hydrology / Environmental effects / Agricultural production / Sustainability / Thailand / Cambodia / Laos / Vietnam / Mekong River*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15728)

13718. **FAO. 1986.** Irrigation in Africa South of the Sahara. Rome, Italy: FAO. 175p. (FAO Investment Center technical paper no.5)

*Irrigation / Africa South of Sahara*

(Location: ICID Record No: 26191)

13719. **Hor, L.K. 1994.** Irrigation sector situation of the Kingdom of Cambodia. In IIMI, International Conference



on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.81-85.

*Irrigation management / Water policy / Benefits / Cambodia*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15553)

13720. **Horii, K. 1994.** A comparative study on water control system in Malaysian and Japanese farming society. In Orii, K. (Ed.), Trial research report on a comparative study of irrigation institutions in Asia. Saitama-Ken, Japan: Daito Bunka University. pp.25-56.

*Water management / Water control / Water distribution / Rice / Farming systems / Irrigation canals / Farmer participation / History / Colonialism / Water policy / Villages / Farmers' associations / Legal aspects / Malaysia / Japan*

(Location: HQ Call No: P 3347 Record No: H 14326)

13721. **ICID. 1994.** Agenda. Forty-fifth International Executive Council Meeting, ICID, Varna, Bulgaria, 1994: Pre-Council meetings 17-21 May 1994. New Delhi, India: ICID. v, 25p. + appendix.

*Irrigation / Drainage / Conferences / Research institutes*

(Location: HQ Call No: 631.7 G000 ICI Record No: H 14135)

13722. **ICID. 1994.** Report on special session on Aral Sea Basin, Varna, Bulgaria, 19 May 1994. New Delhi, India: ICID. 74p.

*Water resources / Russian Federation / Aral sea*  
(Location: ICID Record No: 26171)

13723. **ICID. 1991.** The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. vi, 324p.

*Irrigation systems / Drainage / Conferences*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14725)

13724. **ICID. 1991.** The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. vi, 354p.

*Irrigation management / Irrigation systems / Drainage / Conferences*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14909)

13725. **ICID. 1991.** The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. vi, 305p.

*Irrigation systems / Drainage / Conferences*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14885)

13726. **IIMI. Burkina Faso. 1993.** Irrigation et environnement. Namanegdzanga, 16p.

*Environment / Irrigation effects / Agricultural production / Burkina Faso*

(Location: HQ Call No: IIMI 631.7 G226 IIM Record No: H 13709)

13727. **Jagan, B.R.; Raj, S.D. 1993.** Using irrigation systems in India to develop small hydro plants. Water Resources Journal, 177:70-74.

*Hydroelectric schemes / Irrigation systems / Energy / India*

(Location: HQ Call No: PER Record No: H 14061)

**Abstract:** Existing irrigation schemes and large powerplants are being exploited in the State of Karnataka, India, for generating energy with small hydro plants. But state and national government laws impede rapid and easy implementation, and lack of local industry is leading to excessive dependency on overseas companies. The authors argue that China has evolved solutions to both these problems, and Indian authorities should follow suit.

13728. **Joel, A. 1993.** Technique d'irrigation appliquee: Resultats d'une etude de terrain menee en 1990 a Sidi-Bouzyd, Tunisie: a minor field study. [The application of irrigation: Results of a field study conducted in 1990 at Sidi Bouzyd, Tunisia] Uppsala, Sweden: Swedish University of Agricultural Sciences. 79p. (SLU International Rural Development Centre working paper no.222)

*Irrigation / Tunisia / Sidi-Bouzyd*

(Location: ODI Call No: R SLU IRDC WP 222 Record No: L 942710)

13729. **Julien, B. 1994.** An extension to possibilistic linear programming. Fuzzy sets and systems, 64:195-206.

*Linear programming / Decision making / Water management / Water quality*

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*Food security / Economic analysis / Irrigation / Technology / Surface irrigation / Sprinkler irrigation / Africa*

(Location: HQ, ODI Call No: 631.7.1 G000 FEY Record No: H 14343)

Abstract: Recognizing the fact that irrigation is a crucial input to food production for many developing nations, attempts are made in this paper to discuss some recent developments in irrigation, bearing in mind the technology-related management issues in the poor technology-importing African nations. Given that the food situation in Africa gives cause for concern, and in view of the present level of sophistication of standard irrigation systems, it is suggested that there is the need to bring the benefits of irrigation quickly to the poor nations by simplifying and economizing irrigation.

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*Border irrigation / Mathematical models / Computer techniques / Infiltration*

(Location: HQ Call No: PER Record No: H 14096)

Abstract: The Hall technique for computing stream advance down an irrigated border strip is shown to be inconsistent in the selection of numerical parameters for approximating infiltrated volume. This inconsistency leads to violation of mass conservation and to error in computed advance. By viewing it in dimensionless terms, the behavior of this error is demonstrated over the practical range of variation of border-irrigation parameters with a K ostiakov infiltration formula and Manning roughness formula. It is shown to vary from insignificant magnitudes under 1% to well over

10%. A correction term to neutralize the inconsistency is presented. An alternate formulation free of the inconsistency and suitable for modern high-speed computers working with a reasonably large number of significant figures is presented. Errors stemming from the basic physical assumption - constant average depth of surface water - are not addressed.

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*Flow measurement / Irrigation programs / Irrigation management / Irrigation operation / Calibrations / Monitoring / Water delivery / Sri Lanka / Polonnaruwa / Parakrama Samudra Scheme / Magalwewa Scheme / Nikaweratiya*

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*Water shortage / Water stress / Cropping systems / Irrigated farming / Irrigation requirements / Crop yield / Iran*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15724)

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(Location: HQ, ODI Call No: P 3595 Record No: H 15278)

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*Irrigation scheduling / Maize / Water use efficiency*

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*Drip irrigation / Soil water relations / Mathematical models*

(Location: HQ Call No: PER Record No: H 13082)

**Abstract:** Soil-water distribution in homogeneous soil profiles of Yolo clay loam and Yolo sand (Typic xerorthents) irrigated from a circular source of water, was measured several times after the initiation of irrigation. The effect of trickle discharge rates and soil type on the locations of the wetting front and soil-water distribution was considered. Soil-water tension and hydraulic conductivity, as functions of soil-water content, were also measured. The theories of time-dependent, linearized infiltration from a circular source and a finite-element solution of the two-dimensional transient soil-water equation were compared with the experimental results. In general, for both soils the computer horizontal and vertical advances of the wetting fronts were closely related to those observed. With both theories, a better prediction of the wetting front position for the clay loam soil than for the sandy soil is shown. The calculated and measured horizontal vertical advances did not agree over long periods of time. With the linearized solution, overestimated and underestimated vertical advances for the clay and sandy soils, respectively, were shown. The finite-element model approximate in a better way the vertical advances than the linearized solution, while an opposite tendency for the horizontal advances indicated, especially in sandy soil.

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*Irrigation canals / Flow control / Downstream control / Performance*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15236)

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*Flow control / Irrigation management / Regulated flow / Downstream control*

(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14355)

**Abstract:** In order to maintain an effective water management in irrigation systems, methods and means of flow control have developed significantly in the past decades. However, it is still not yet understood what type of flow control system should be applied in a specific irrigation system, and under what circumstances. This article presents a classification of flow control in irrigation main systems, based on the different control parameters. A major division can be made into systems with (i) no management, (ii) central management, and (iii) self management. The term "self management" means that the system itself converges to a new equilibrium state. The regulation of these systems can be either (i) no regulation, (ii) manually or (iii) automatically, whereas automatic regulation is not similar to self management. Control systems can be classified into: proportional control, upstream control, downstream control, volume control, ELFLO control and CARDD control, each of them having their advantages and disadvantages.

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*Flow control / Irrigation water / Regulated flow / Water control*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15251)

13785. **Armstrong, A.C.; Castle, D.A. 1993.** The sensitivity of drainage system design to climate change. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: *Water management in the next century*. Transactions: Vol.1-A, Question 44, R1-R35: Planning and design of irrigation and drainage systems. pp.89-99.

*Drainage / Hydraulics / Climate / Water table*

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Record No: H 15068)

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*Simulation models / Irrigation scheduling / Crop production / Water stress / Cotton / Plant growth / Statistical analysis / Water use*

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Record No: H 14464)

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*Irrigation canals / Sedimentation / Control methods / Irrigation engineering / Silt / Irrigation design / Pakistan*

(Location: HQ Call No: D 631.7.1 G730 ASH  
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*Irrigation design / Sedimentation / Control methods / Computer techniques / Performance / Simulation models / Measurement / Tanzania*

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13790. **Atkinson, E. 1991.** Sediment delivery in river systems. Wallingford, UK: Hydraulics Research. 50p. (Technical note OD/TN 48)

*Sedimentation / Rivers / Catchment areas / Philippines*

(Location: HQ Call No: 631.7.1 G000 ATK  
Record No: H 14262)

13791. **Award, U. 1994.** Application of new engineering methods in the 2nd phase of the Shinano River Left Bank Irrigation Project. *Journal of Irrigation Engineering and Rural Planning*, 26:90-92.

*Irrigation engineering / River basins / Construction technology / Japan*

(Location: HQ Call No: PER Record No: H 14382)

13792. **Ayers, T.G.; Patrick, D. 1993.** Real time data in irrigation canal systems: Three case studies in North America. In *ICID, 15th International Congress on Irrigation and Drainage*, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-G, Symposium. R.8. New Delhi, India: ICID. pp.125-138.

*Irrigation canals / Irrigation systems / Irrigation management / Water control / Water delivery / Case studies / USA / Canada*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15733)

13793. **Bari, M.F. 1993.** Hydraulic model investigation of downstream erosion of large regulators: A case study. *Irrigation and Drainage Systems*, 7(2):131-150.

*Hydraulics / Models / Flow regulators / Erosion / Case studies / Bangladesh*

(Location: HQ Call No: PER Record No: H 13683)

**Abstract:** Flow conditions, which could not be explained, occurred in the stilling basin and outfall channel of the Feni Regulator sited at the western end of the Feni River closure dam. This regulator controls outflows from the upstream reservoir which supplies irrigation water to Muhuri Project in Bangladesh. Analysis of flood discharge data revealed that the design discharge for the structure was not exceeded; yet abnormal scour occurred in the outfall channel and the brick block rip-rap placed thereon was damaged. A model study was conducted to understand the causes of such unusual local erosion downstream of the stilling basin and to provide answers to two main questions: - Is potential scour serious in terms of the stability of the structure? - What protection measures could be taken to stabilize the scour at a safe level? Using a 1:30 scale model, the probable maximum scour was simulated, and the performance of alternative rip-rap designs including that of the existing one were examined. The results of this study supplemented by field scour data collected during subsequent flood seasons indicated that even if the flow rate through the regulator approaches the design flood discharge, the downstream scour is not likely to extend up to an elevation of - 10.7m, a scour level observed in the previous year at a lower discharge. It also showed that the existing rip-rap blocks were marginally undersized and consequently the rip-rap was prone to failure if flow conditions

departed from uniform. A suitable method of scour protection downstream of the stilling basin at the regulator exit also evolved from the study.

13794. **Basagaoglu, H.; Yazicigil, H. 1994.** Optimal capacity-expansion planning in multiaquifer systems. *Journal of Water Resources Planning and Management*, 120(6):836-856.

*Aquifers / Simulation models / Optimization methods / Performance / Water demand*

(Location: HQ Call No: PER Record No: H 15587)

13795. **Bastiaansen, A.P.M. 1992.** Irrigation system design for sustainable use. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management*, Leuven, Belgium, 14-17 September 1992. Vol. 1. Leuven, Belgium: Center for Irrigation Engineering. pp.235-244.

*Irrigated farming / Cropping systems / Irrigation systems / Sustainability / Decision making / Design criteria / Irrigation management / Africa / Middle East / East Asia*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14352)

**Abstract:** The approach towards the development of irrigated agriculture as a distinct and in time restricted intervention with predetermined objectives based on agronomic, technical and economic criteria must be abandoned for an open-ended approach to rural development, whereby irrigation is seen as one of the activities of the farm household and whereby the water user and the socio-political conditions constitute important criteria. The supposition that the design of the physical network must take into account wishes and demands of the water users regarding the use of the scheme make their participation a precondition for design. This asks for an interactive and iterative approach to the technical design and consequently the design assumes the nature of a process. Attention must be paid to the nature and structure of this process. In this article the author gives his vision on the consequences of the use of the scheme as the central focus for the design and the design process, based on his long field experience in Africa, the Near East and the Far East.

13796. **Bastiaansen, W.G.M.; Roest, C.W.J.; Abdel Khalek, M.A.; Pelgrum, H. 1992.** Monitoring crop growth in large irrigation schemes on the basis of actual evapotranspiration: Comparison of remote sensing algorithm and simulation model results. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sus-*



tainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.473-483.

*Crops / Plant growth / Monitoring / Large-scale systems / Irrigation programs / Irrigation efficiency / Monitoring / Performance evaluation / Evapotranspiration / Remote sensing / Simulation models / Mapping / Irrigation management / Water management / Computer techniques / Egypt / Nile River*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14428)

13797. **Bautista, E.; Wallender, W.W. 1993.** Optimal management strategies for cutback furrow irrigation. Journal of Irrigation and Drainage Engineering, 119(6):1099-1114.

*Furrow irrigation / Infiltration / Mathematical models*

(Location: HQ Call No: PER Record No: H 13680)

**Abstract:** The optimal management of a cutback-furrow-irrigation system with spatially variable infiltration based on an average intake function was analyzed. The problem was formulated as a cost-minimization function subject to meeting a specified fraction of the irrigation requirement. Optimal solutions were examined in the context of developing a real-time control system for furrow irrigation. Although total infiltration was adequately predicted with the average function, final water distribution was not. Consequently, the optimal policies resulted in actual requirement efficiencies less than the target value. Nonetheless, relative changes in performance as a function of the constraint were well predicted. The performance index was relatively insensitive near the optimum, and cutback time had the least impact on application efficiency and uniformity. Satisfactory performance was therefore still obtained by reducing the inflow after the final advance time. Similar values of application efficiency were generally computed with decreasing application depths, but smaller efficiency resulted when the optimized cutoff time was less than the final advance time. There were small performance differences between discrete and continuous-time cutback functions.

13798. **Bekisoglu, S. 1993.** Sediment accumulation in irrigation canals and trap efficiency of the desilting basins. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century: Transactions: Vol.1-D, Question

44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1363-1372.

*Irrigation canals / Siltation / Sedimentation / Control methods / Dams / River basin development / Design criteria / Maintenance / Aquatic weeds / Turkey*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 13938)

13799. **Bender, M.; Simonovic, S. 1994.** Time-series modeling for long-range stream-flow forecasting. Journal of Water Resources Planning and Management, 120(6):857-870.

*Stream flow / Forecasting / Models / Hydrology / Case studies*

(Location: HQ Call No: PER Record No: H 15588)

13800. **Beomonte, B. 1991.** The use of water for irrigation in a regional water plan under conditions of water scarcity. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. pp.45-55.

*Water scarcity / Regional planning / Irrigation water / Simulation models / Optimization / Sardinia*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14890)

13801. **Bertuzzi, P.; Bruckler, L.; Bay, D.; Chanzy, A. 1994.** Sampling strategies for soil water content to estimate evapotranspiration. Irrigation Science, 14(3):105-115.

*Evapotranspiration / Soil moisture / Soil water relations / Simulation*

(Location: HQ Call No: PER Record No: H 13985)

13802. **Bhargava, S.K.; Kumar, S.K. 1993.** Challenges for dynamic maintenance. In Jurriens, M.; Jain, K. P. (Eds.), Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands. New Delhi, India: ILRI/WALMI. pp.155-161.

*Maintenance / Irrigation canals / Farmer participation / Monitoring / India / Uttar Pradesh*

(Location: HQ Call No: 631.7.1 G635 JUR Record No: H 15141)

13803. **Bhatti, A.K. 1993.** Rationalizing planning and design parameters of subsurface pipe drainage in the socio-economic context of Pakistan. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.713-722.

*Subsurface drainage / Surface drainage / Pipes / Design criteria / Groundwater management / Social aspects / Public sector / Farmer participation / Pakistan*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15239)

13804. **Bhutta, M.N.; Vlotman, W.F.; Khan, M.A.; Roos, P. 1992.** Seepage losses from irrigation canals of Punjab, Pakistan. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.535-543.

*Irrigation canals / Seepage loss / Field tests / Groundwater / Drainage / Water management / Flow measurement / Flow discharge / Aquifers / Pakistan / Punjab*

(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14434)

13805. **Billib, H. A.; Boochs, P. W. 1991.** Management of an artificial underground reservoir for irrigation. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.83-94.

*Arid zones / Reservoirs / Dams / Subsurface irrigation / Groundwater / Aquifers / Water storage / Simulation models / Conjunctive use / Calibrations / Brazil*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 14731)

13806. **Binh, N.D.; Murty, V.V.N.; Hoan, D.X. 1994.** Evaluation of the possibility for rainfed agriculture using a soil moisture simulation model. Agricultural Water Management, 26(3):187-199.

*Soil moisture / Simulation models / Mathematical models / Rain-fed farming / Vietnam*

(Location: HQ Call No: PER Record No: H 15666)

13807. **Bird, J.D.; Gillott, P.W.K. 1992.** A quantitative review of adequacy and equity indicators for irrigation system distribution. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 3. Leuven, Belgium: Center for Irrigation Engineering. pp.901-914.

*Irrigation systems / Assessment / Performance indexes / Water supply / Rain / Water requirements / Equity*

(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14471)

13808. **Bisht, R.S. 1994.** Secrets of the water fort. Down to Earth, May 15:25-31.

*History / Irrigation / Water management / Water conservation / Drains / Drainage / Reservoirs / Tanks / India / Dholavira*

(Location: HQ Call No: P 3479 Record No: H 14617)

13809. **Blaisdell, F.W. 1994.** Results of parshall flume tests. Journal of Irrigation and Drainage Engineering, 120(2):278-291.

*Flumes / Models / Flow discharge*

(Location: HQ Call No: PER Record No: H 14095)

13810. **Blanc, J.; Tomei, A.; Magnin, C. 1993.** Definition d'indices pour le controle de performances des ouvrages hydrauliques. [Indices for checking performances of hydraulic structures] In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.637-650.

*Performance indexes / Hydraulics*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15234)

13811. **Blank, H.G. 1975.** Optimal irrigation decisions with limited water. Dissertation submitted to the Colorado State University in partial fulfillment of the requirements for the Degree of Doctor of Philosophy. xiii, 241p.

*Irrigation management / Water management / Water scarcity / Water use efficiency / Optimization methods / Simulation models / Mathematical models / Soil moisture / Agronomy / Crops / Linear programming / Economic aspects / USA / Colorado*

(Location: HQ Call No: 631.7.1 G000 BLA  
Record No: H 13760)

13812. **Bobba, A.G. 1993.** Field validation of 'SUTRA' groundwater flow model to Lambton County, Ontario, Canada. Water Resources Management, 7(4):289-310.

*Groundwater / Computer techniques / Simulation models / Calibrations / Aquifers / Statistical analysis / Canada*

(Location: HQ Call No: PER Record No: H 14306)

13813. **Bonnell, R.B.; Broughton, R.S.; Gomaa, F. 1993.** Test of a frequency independent method for measuring bulk soil salinity using time domain reflectometry. ICID Bulletin, 42(2):43-56.

*Soil salinity / Measuring instruments / Calibrations*

(Location: HQ Call No: PER Record No: H 14498)

13814. **Bonta, J.V.; Rao, A.R. 1994.** Seasonal distributions of peak flows from small agricultural watersheds.

Journal of Irrigation and Drainage Engineering, 120(2):422-439.

*Watersheds / Land use / Soils / Rainfall-runoff relationships / Models / USA*

(Location: HQ Call No: PER Record No: H 14100)

13815. **Bos, M.G.; Murray-Rust, D.H.; Merrey, D.J.; Johnson, H.G.; Snellen, W.B. 1994.** Methodologies for assessing performance of irrigation and drainage management. Irrigation and Drainage Systems, 7(4):231-261.

*Performance / Irrigation / Drainage*

(Location: HQ Call No: PER. IIMI 631.7.1 G000 BOS Record No: H 3969)

Abstract: Paper presented at the ICID Conference, The Hague, Holland, 30 August-11 September 1993. 30p.

13816. **Bouman, B.A.M. 1994.** A framework to deal with uncertainty in soil and management parameters in crop yield simulation: A case study for rice. Agricultural Systems, 46(1):1-17.

*Crop yield / Simulation models / Rice / Soil texture / Plant growth / Rain-fed farming / Case studies / Philippines*

(Location: HQ Call No: PER Record No: H 14686)

13817. **Brabben, T. 1994.** Mechanized construction and maintenance of earthen watercourses, Pakistan. Grid, 4:9.

*Watercourses / Water conveyance / Mechanization / Construction / Maintenance / Pakistan*

(Location: HQ Call No: P 3338 Record No: H 14026)

13818. **Brainard, E.C.; Gelhar, L.W. 1992.** Influence of vertical flow on groundwater transport. Water Resources Journal, September:42-51.

*Groundwater management / Flow / Mathematical models*

(Location: HQ Call No: PER Record No: H 13708)

**Abstract:** Two-dimensional analysis of groundwater flow using graphical flow net analysis or numerical modelling is applied to many field settings. However, the assumption of hydrostatic head conditions, implicit in two-dimensional depth-averaged planimetric analyses, is not correct for situations where there is vertical flow such as near a partially penetrating stream. Vertical flow is particularly important when predicting flow paths for contaminant transport. An analytical solution is presented, which calculates the flow paths in the vicinity of a partially penetrating stream. The derivation assumes radial flow towards the stream in the vicinity of the stream, and predominantly horizontal Dupuit flow in the remainder of the region. The analytical solution may be used as a correction to apply to flow paths generated by two-dimensional analysis, or as a screening tool to

determine the error when vertical flow is neglected by two-dimensional analysis. To verify the analytical solution, it is compared to numerical simulations of three-dimensional flow in an idealized aquifer for a number of cases with varying degrees of hydraulic conductivity anisotropy. An example illustrates the use of the analytical solution. For the example presented, two-dimensional analysis can underestimate the distance which a contaminant travels before discharging into the stream by almost a mile.

13819. **Braken, A. 1993.** Institutional development for improved performance of South-Indian canal irrigation systems: A search for opportunities and relevant linkages. Nijmegen, Netherlands: Third World Centre, Catholic University. ix, 125p. (Occasional paper/Third World Centre; 35)

*Irrigation management / Irrigation canals / Performance / Institution building / Agricultural development / Case studies / India*

(Location: HQ Call No: D 631.7.1 G635 BRA Record No: H 14311)

13820. **Bralts, V.F.; Edwards, D.M. 1986.** Field evaluation of drip irrigation submain units. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.1659-1664.

*Drip irrigation / Performance evaluation*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13864)

13821. **Brandyk, T.; Skapski, K.; Szatylowicz, J. 1993.** Design and operation of drainage-subirrigation systems in Poland. Irrigation and Drainage Systems, 7(3):173-187.

*Drainage / Irrigation systems / Water management / Design / Groundwater management / Poland*

(Location: HQ Call No: PER Record No: H 12058)

**Abstract:** The different techniques used in the design and operation of drainage-subirrigation systems in low-lying riverine areas in Poland are presented. The required groundwater levels used as designing criteria and the applications of the steady state and unsteady state approach to ditch (drain) spacing design in different soil conditions are discussed. The practical application of groundwater level maintenance using the techniques of controlled drainage, subirrigation with a constant water level, and subirrigation with a regulated water level, are shown for three different field sites.

13822. **Brandyk, T.; Skapski, K.; Szatylowicz, J. 1993.** Design criteria for subirrigation systems with a constant water level. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of

irrigation and drainage systems. New Delhi, India: ICID. pp.615-620.

*Irrigation design / Groundwater / Soil water / Precipitation / Water deficit*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15231)

13823. **Brett, M.L.A.; Davey, C.J.N.; Shamim-uddin Ahmad. 1993.** Design of vortex tube sand extractors for the Jamrao canal. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century: Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1321-1330.

*Irrigation canals / Irrigation design / Sedimentation / Models / Pakistan / Sindh / Indus River*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 13411)

13824. **Brewer, J. (Ed.) 1986.** Small-scale irrigation technical assistance in Indonesia: Sulawesi Selatan, Nusa Tenggara Barat, Nusa Tenggara Timur: Final report. Paper prepared at Cornell University for the Water Management Synthesis II Project, USAID contract DAN-1527-C-00-0086-00, to the Consortium for International Development, June 1986. vi, 179p.

*Small scale systems / Water management / Irrigation programs / Project planning / Project appraisal / Cost benefit analysis / Crop production / Indonesia*

(Location: HQ Call No: P 3559 Record No: H 14842)

13825. **Briassoulis, H. 1994.** Effectiveness of water-conservation measures in Greater Athens Area. Journal of Water Resources Planning and Management, 120(6):764-777.

*Water conservation / Models / Greece / Athens*

(Location: HQ Call No: PER Record No: H 15585)

13826. **Buchtele, J. 1993.** Runoff changes simulated using a rainfall-runoff model. Water Resources Management, 7(4):273-287.

*Rainfall-runoff relationships / Simulation models / Soil moisture / Precipitation / Evapotranspiration / Climate*

(Location: HQ Call No: PER Record Jo: H 14305)

13827. **Bunjes, J.H. 1993.** New developments on medium and large sized pumping stations with prefabricated concrete modules. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.899-908.

*Pumping / Water supply / Water management / Monitoring / Automation / Computer techniques*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15254)

13828. **Buras, N. 1991.** Integrated operation of canal networks and groundwater aquifers. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.39-61.

*Irrigation canals / Networks / Groundwater / Aquifers / Simulation models / Pakistan / Indus River*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14728)

13829. **Burt, C. 1994.** The Irrigation Consumer Bill of Rights. Irrigation Journal, 44(4):32-33.

*Irrigation equipment / Irrigation systems / Users' perspective / USA / California*

(Location: HQ Call No: PER Record No: H 14973)

13830. **Burt, C.M. 1994.** Media tanks for filtration. Part 1: Tank sizing and media selection. Irrigation Journal, 44(5):14, 16-17.

*Tanks / Water storage / Filtration / Design / Water quality / Irrigation water*

(Location: HQ Call No: PER Record No: H 15389)

13831. **Buydens, W.J.R. 1993.** Equity considerations in irrigation systems analysis: The Sina Project in Maharashtra, India. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-F, Question 45, R30-R49: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.585-597.

*Irrigation management / Equity / Water distribution / Plant growth / Simulation models / Optimization / Linear programming / India / Maharashtra*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15655)

13832. **Cahoon, J.; Eisenhauer, D. 1994.** Inferences of the cycle ratio-time surged flow infiltration function. Irrigation Science, 15(4):173-182.

*Infiltration / Simulation models / Surge irrigation / Furrow irrigation*

(Location: HQ Call No: PER Record No: H 15698)

13833. **Camacho, E.; Roldán, J.; Alcaide, M. 1993.** Comparison between continuous and surge furrow irrigation. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1305-1314.

- Surge irrigation / Furrow irrigation / Infiltration / Spain*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15356)
13834. Carruthers, I. 1985. Protecting irrigation investment: The drainage factor. *Ceres*, 18(4):15-21.  
*Drainage / Investment / Irrigation programs / Salinity / Groundwater / Tube wells*  
(Location: HQ Call No: P 3315 Record No: H 13958)
13835. Ceccon, P.; Contin, M.; Giovanardi, R.; Zerbi, G. 1993. A lysimeter facility covered by an automatic rain shelter: Design and installation. *ICID Bulletin*, 42(2):31-42.  
*Lysimetry / Measuring instruments / Irrigation equipment / Evapotranspiration / Leaching / Water table / Rain / Irrigation design / Construction / Costs / Performance / Soil-water-plant relationships / Italy*  
(Location: HQ Call No: PER Record No: H 14497)
13836. Chakravorty, U.; Roumasset, J. 1994. Incorporating economic analysis in irrigation design and management. *Journal of Water Resources Planning and Management*, 120(6):819-835.  
*Water allocation / Optimization methods / Models / Irrigation design / Economic analysis / Irrigation canals / Water conservation*  
(Location: HQ Call No: PER Record No: H 15586)  
**Abstract:** Traditional principles for the design, operation, and evaluation of irrigation systems do not adequately incorporate the scarcity value of water. This paper presents an operational framework that attempts to integrate economic concepts into irrigation design and management. By means of a simple spatial optimization model, conditions are derived for optimal water allocation at each location in the system. Principles for optimal investment in distribution canals and in water conservation technology on the farm are obtained. Irrigated area and aggregate water use are determined. The potential economic benefit of the proposed model is demonstrated through an illustrative example.
13837. Chan, N. 1994. Partial infeasibility method for chance-constrained aquifer management. *Journal of Water Resources Planning and Management*, 120(1):70-89.  
*Aquifers / Wells / Groundwater management / Optimization methods / Simulation / Hydraulics / Mathematical models / Monaco / Monte Carlo*  
(Location: HQ Call No: PER Record No: H 13771)
13838. Chiew, F.H.S.; McMahon, T.A. 1992. The applicability of Morton's and Penman's evapotranspiration estimates in rainfall-runoff modelling. *Water Resources Journal*, September:32-40.  
*Evapotranspiration / Rainfall-runoff relationships / Mathematical models / Australia*  
(Location: HQ Call No: PER Record No: H 13707)
13839. China. Ministry of Water Resources. 1990. Pumping stations for irrigation and drainage in China. Beijing, China: Agricultural Publishing House. 88p.  
*Pumping / Irrigation programs / Water distribution / Drainage / Irrigation water / China*  
(Location: HQ Call No: 631.7.1 G592 CHI Record No: H 14805)
13840. Chirouze, J.P. 1993. Le Lauragais Audois exemple de perimetre de taille moyenne necessitant des infrastructures hydrauliques importantes. [The Lauragais Audois an example of medium size irrigation project requiring large hydraulic structures] ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.105-120.  
*Irrigation programs / Hydraulic structures / Farmer participation*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15614)
13841. Chu, S.T. 1994. Green-ampt analysis of wetting patterns for surface emitters. *Journal of Irrigation and Drainage Engineering*, 120(2):414-421.  
*Infiltration / Drip irrigation / Mathematical models*  
(Location: HQ Call No: PER Record No: H 14099)  
**Abstract:** A three-dimensional Green-Ampt analysis is developed, and the infiltration capacity curve for a three-dimensional infiltration model is presented. The infiltration-capacity curve represents the time distribution of wetting-pattern volume of a water source with unlimited inflow supply. A significant feature of the infiltration-capacity curve is that the infiltration-capacity rate increases with time during extended infiltration periods. This feature is different from the one-dimensional infiltration model where the infiltration-capacity rate decreases with time. The infiltration-capacity curve is applied to describe the wetting pattern of a surface emitter with a constant discharge by matching the emitter discharge with the average infiltration-capacity rate. Algebraic solutions of the wetted radius and the maximum wetting-pattern depth are derived. Graphical solutions of the infiltration-capacity curve are presented. A numerical example is prepared to illustrate the procedure for estimating time application, wetting pattern volume, emitter

discharge, and irrigation period of a surface emitter in a drip-irrigation system.

13842. **Chu, S.T. 1994.** Transient radius of influence model. *Journal of Irrigation and Drainage Engineering*, 120(5):964-969.

*Groundwater / Aquifers / Mathematical models / Wells / Hydraulics / Recharge / Pumping*

(Location: HQ Call No: PER Record No: H 15376)

13843. **Citeau, J.M.; Gleyses, G.; Rieu, T. 1993.** Etude economique prealable a la conception d'un reseau d'irrigation et evaluation de la demande en eau. [Economic pre-feasibility study for the design of an irrigation system and evaluation of water demand] In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1151-1166.

*Irrigation design / Water demand / Water requirements / Project appraisal / Decision support tools / France*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15346)

13844. **Clark, G.A. 1994.** Drip management and scheduling. *Far Eastern Agriculture*, May/June:21-22.

*Drip irrigation / Irrigation scheduling / Water budget / Soil-water-plant relationships*

(Location: HQ Call No: P 3596 Record No: H 15284)

13845. **Clark, M.J.; Gurnell, A.M.; Davenport, J.; Azizi, A. 1993.** Integrated river channel management through geographic information systems. In Currie, J.C.; Pepper, A.T. (Eds.), *Water and the environment*. Chichester, UK: Ellis Horwood. pp.233-245.

*Open channels / GIS / Models / Environmental effects / Rivers / Land use*

(Location: HQ Call No: 333.91 G000 CUR Record No: H 15015)

13846. **Clemente, R.S.; De Jong, R.; Hayhoe, H.N.; Reynolds, W.D.; Hares, M. 1994.** Testing and comparison of three unsaturated soil water flow models. *Agricultural Water Management*, 25(2):135-152.

*Evaporation / Models / Leaching / Sandy soils / Clay soils / Evapotranspiration / Soil water relations / Canada*

(Location: HQ Call No: PER Record No: H 14268)

13847. **Clemmens, A.J. 1986.** Border irrigation uniformity: Combined effects of infiltration. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.1314-1319; 1324.

*Infiltration / Basin irrigation / Simulation models / Irrigation efficiency / Water distribution*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13861)

13848. **Clemmens, A.J.; Sloan, G.; Schuurmans, J. 1994.** Canal-control needs: Example. *Journal of Irrigation and Drainage Engineering*, 120(6):1067-1085.

*Irrigation canals / Water delivery / Simulation models / Computer models / Water control / USA / Arizona*

(Location: HQ Call No: PER Record No: H 15682)

13849. **Cobbaert, J.; Moens, V.; De Troch, F.; Troch, P. 1992.** A computer simulation model for design and control of open channel irrigation systems: Application to the Medjerda Valley, Tunisia. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992*. Vol. 1. Leuven, Belgium: Center for Irrigation Engineering. pp.137-146.

*Simulation models / Computer techniques / Mathematical models / Calibrations / Open channels / Irrigation systems / Design / Tunisia*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14344)

**Abstract:** This paper describes a mathematical model to investigate the hydraulic behavior of water delivery systems. To compute subcritical open-channel flow in branched and looped networks, an algorithm was used which allows computation of the flow depths and discharges at all sections simultaneously. The algorithm is accurate, efficient and suitable for computer simulation. The software developed using this algorithm is called PSINOWAT. Newton-Raphson method is used to solve the set non-linear equations. Measurements were carried out in Tunisia: first on the experimental network in Tunis and secondly on an irrigation system located in the Medjerda-valley. General and local energy losses were calculated in the networks and optimized values of the head losses were obtained by the direction-set-method. Verification, using these optimized values, showed that accurate water depths and discharges could be calculated. For use in project and simulation studies, design values are proposed. A sensitivity analysis has been carried out to show the relative effect of variations of the input parameters on the models results.

13850. **Cretu, G.; Rosu, C. 1992.** Decisions for the functioning of an irrigation system in the hydrotechnical system assembly. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the*

Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.747-755.

*Irrigation systems / Water management / Mathematical models / Flow discharge / Water supply / Decision support tools / Romania*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14455)

13851. D'Urso, G.; Querner, E.P.; Morabito, J.A. 1992. Integration of hydrological simulation models with remotely sensed data: An application to irrigation management. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.463-472.

*Water requirements / Crops / Simulation models / Remote sensing / Image processing / Irrigation management / Irrigation efficiency / Performance indexes / Evapotranspiration / Surface irrigation / Groundwater / Argentina / Mendoza*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14427)

13852. Dahlblom, P. 1993. Simulation of contaminated groundwater migration in fractured rock by a laminar pipe-flow model. Water Resources Journal, 178:53-63.

*Groundwater / Flow / Simulation / Mathematical models / Pipes / Field tests*

(Location: HQ Call No: PER Record No: H 14044)

**Abstract:** In this paper, the ability of a laminar pipe-flow model to reproduce the hydrodynamic transport of contaminated groundwater in fractured rock is investigated. It is assumed that the cross-section areas are circular and that the flow is laminar. The molecular diffusion is neglected as well as the impact of variations in velocity over the cross-section area. It is assumed that the cross-section areas in an ensemble of tubes have a gamma distribution. The model is applied to field tracer experiments at two sites. It is shown that the mean size of the cavities is smaller, deeper into the ground and that the distribution is narrower. Different values of the parameter of the gamma distribution were used to reproduce the breakthrough course at the different sites. It was shown that there is no general relation between conductivity of a porous medium and its porosity when the pore size distribution is not taken into account.

13853. Dahmen, E.R.; Yangtrong, A. 1993. Design and operation of the Tha Maka Irrigation Network (Thailand) In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.191-207.

*Irrigation design / Irrigation operation / Water distribution / Diversion / Water control / Water allocation / Irrigation canals / Thailand*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15077)

13854. Das, B.; Loof, R.; Paudyal, G.N. 1992. Integrated approach for the main system operation and management in a canal irrigation system. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.737-745.

*Irrigation canals / Irrigation systems / Irrigation management / Irrigation operation / Simulation models / Mathematical models / Optimization methods / Decision support tools*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14454)

13855. Daud, M.; Zohadie, B.M.; Salim, S. 1992. PADI-ExAn expert system for predicting water use in a paddy irrigation scheme. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.845-851.

*Computer techniques / Water use / Rice / Crop-based irrigation / Water management / Water distribution / Expert systems / Databases*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14466)

13856. Daudet, G. 1993. Low-flow irrigation: System maintenance from the inside out. Irrigation Journal, 43(7):18-22.

*Irrigation systems / Maintenance / Water distribution / Crop production / USA / California*

(Location: HQ Call No: PER Record No: H 14086)

13857. Dautrebande, S. 1993. Examples of GIS for selection and follow-up of sites for drainage or irrigation. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water manage-

ment in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.569-590.

*GIS / Mapping / Remote sensing / Drought / Waterlogging / Wetlands / Land use / Belgium / Sahel / Burkina Faso*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15228)

13858. Day, R.W. 1994. Performance of gunite brow ditches. Journal of Irrigation and Drainage Engineering, 120(5):957-963.

*Drainage / Performance / Design / Construction / USA*

(Location: HQ Call No: PER Record No: H 15375)

13859. de Boer, D.W.; Kohl, R.A. 1993. Performance characteristics of reduced pressure sprinklers. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1033-1044.

*Sprinkler irrigation / Performance / Irrigation equipment*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15336)

13860. De Groot, K. 1994. Seed-corn producer nurtures the heartland's future. Irrigation Journal, 44(5):18-19.

*Irrigated farming / Maize / Water distribution / Irrigation efficiency / Water quality / Chemical control / Chemigation / USA / Nebraska*

(Location: HQ Call No: PER Record No: H 15390)

13861. de Sousa, P.L.; Dedrick, A.R.; Clemmens, A.J.; Pereira, L.S. 1993. Benefits and costs of laser-controlled leveling - A case study. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1237-1247.

*Water distribution / Levelling / Land development / Tillage / Irrigation efficiency / Maize / Crop production / Cost benefit analysis / USA / Portugal*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15351)

13862. DeBoer, D.W.; Monnens, M.J.; Kohl, R.A. 1992. Operational characteristics of two rotating-plate sprinklers. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September

1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.339-346.

*Sprinkler irrigation / Irrigation equipment*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14363)

**Abstract:** Two new irrigation sprinklers with rotating spray plates were evaluated under laboratory conditions. The sprinklers (R-series, less than 5 rpm, and S-series, greater than 275 rpm) are designed for use on continuous-move irrigation laterals. Four- and six-channel rotating spray plates were operated at 90 and 140 kPa pressures. Radial water application patterns were bimodal in shape. Coefficients of application uniformity for continuous-move laterals were sensitive to sprinkler spacing and varied from 83 to 99 percent. From 51 to 84 percent of the sprinkler discharge was composed of drops smaller than 2 mm in diameter; however, drop sizes larger than 4 mm were common. Drop size distributions did not follow the Rosin-Rammler drop distribution expression for all drop sizes but can be approximated by two expressions for each sprinkler condition. Kinetic energy values for the sprinkler discharge varied from 7.9 to 16.8 Jm<sup>-2</sup> mm<sup>-1</sup>. Satisfactory performance should be expected from these sprinklers for field conditions.

13863. den Herder, J.C. 1993. Mechanical equipment for small maintenance. In Jurriens, M.; Jain, K. P. (Eds.), Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands. New Delhi, India: ILRI/WALMI. pp.57-68.

*Irrigation canals / Maintenance / Mechanical methods / Irrigation equipment*

(Location: HQ Call No: 631.7.1 G635 JUR Record No: H 15134)

13864. Dia, I.S.; Mollinga, P.P. 1993. Irrigation design and African farming systems. In Ubels, J.; Horst, L. (Eds.), Irrigation design in Africa: Towards an interactive method. Wageningen, Netherlands: Wageningen Agricultural University. pp.22-40.

*Irrigation design / Farming systems / Farmer participation / Households / Africa / Gambia*

(Location: HQ Call No: 631.7.1 G100 UBE Record No: H 13912)

13865. Dianxiang, G.; Anming, Z.; Yijun, M. 1993. Composite canal linings for the prevention of seepage and frost heaving. ICID Bulletin, 42(2):23-29.

*Canal linings / Seepage loss / Construction*

(Location: HQ Call No: PER Record No: H 14496)

13866. Dierickx, W. 1992. Implementation problems of subsurface drainage in irrigation areas. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Con-



ference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 3. Leuven, Belgium: Center for Irrigation Engineering. pp.965-971.

*Subsurface drainage / Arid zones / Pipes / Design / Salinity control*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14476)

13867. **Döring, M. 1993.** Historical irrigation-systems in the Valais/Switzerland. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-I: History special session. R.8. New Delhi, India: ICID. pp.121-132.

*Irrigation systems / Channel improvement / Construction / Water distribution / History / Switzerland*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15741)

13868. **Duchene, M.; McBean, E.A.; Thomson, N.R. 1994.** Modeling of infiltration from trenches for storm-water control. Journal of Water Resources Planning and Management, 120(3):276-293.

*Infiltration / Water quality / Mathematical models / Water table / Simulation models*

(Location: HQ Call No: PER Record No: H 14284)

13869. **Duckstein, L.; Treichel, W.; El Magnouni, S. 1994.** Ranking ground-water management alternatives by multicriterion analysis. Journal of Water Resources Planning and Management, 120(4):546-565.

*Groundwater management / Decision making / Simulation models / Mathematical models / Decision support tools*

(Location: HQ Call No: PER Record No: H 14790)

13870. **Dumandan, G.S. 1994.** Operation and maintenance of lifting irrigation systems in the Philippines. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.203-213.

*Water lifting / Low lift irrigation / Pumps / Groundwater irrigation / Maintenance / Philippines*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14876)

13871. **Dunan, C.M.; Moore, F.D.; Westra, P. 1994.** A plant process-economic model for wild oats management decisions in irrigated barley. Agricultural Systems, 45(4):355-368.

*Weed control / Simulation models / Irrigated farming*

(Location: HQ Call No: PER Record No: H 14492)

13872. **Eching, S.O.; Hopmans, J.W.; Wallender, W.W.; MacIntyre, J.L.; Peters, D. 1994.** Estimation of local and regional components of drain-flow from an irrigated field. Irrigation Science, 15(4):153-157.

*Furrow irrigation / Groundwater / Percolation / Evapotranspiration / Subsurface drainage / Water table*

(Location: HQ Call No: PER Record No: H 15695)

13873. **Eisenhauer, D.E. 1994.** Chemigation: Another use for your irrigation system. Irrigation Journal, 44(2):30-31.

*Irrigation systems / Chemical control / Fertilizers / USA*

(Location: HQ Call No: PER Record No: H 14691)

13874. **ElZeir, M.; Monbaliu, J.; Berlamont, J. 1992.** Comments on an heuristic approach for pipe network design optimization. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 1. Leuven, Belgium: Center for Irrigation Engineering. pp.297-306.

*Pipes / Optimization / Design / Mathematical models / Water distribution / Computer techniques / Simulation*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14358)

**Abstract:** The program PIPE-NET codes an heuristic algorithm. The program has the merits of user friendly interface, easy data input and capability of designing as well as simulating networks. The algorithm can deal with a discrete set of candidate pipes. It uses the simple principle of balance between the energy cost and the pipe cost. The principle is formulated in the Marginal Energy Critical Link technique defined by Rasmusen (1976). However, some shortcomings of this algorithm were observed. The optimal solution of the algorithm is dependent on the initial solution. Its condition to increase the diameters of the pipes, during design, is not so well understood. This condition is replaced by another condition which gives better results. The application of the Marginal Energy Cost concept to the constant level reservoirs has to be validated. The concept of forcing all nodes to be critical is introduced and linked to the algorithm. The modified algorithm tends to reduce the looped system to a tree-like system. The modifications, however, are not

sufficient to eliminate all redundancy of the pipes. This is probably the most important reason why different initial feasible solutions may give different final "optimal" solutions. Ultimately, the redundancy should be included in a reliability measure within the algorithm.

13875. **European Commission on Agriculture.** Working Party on Water Resources and Irrigation. 1973. Drainage machinery. Rome, Italy: FAO. iv, 122p. (Irrigation and drainage paper 15)

*Drainage / Irrigation equipment / Technology / Costs / Belgium / France / Netherlands / Poland / UK / Germany*

(Location: HQ Call No: 631.7.1 G000 EUR Record No: H 14255)

13876. **Evans, R. 1994.** Switch-hitting with subsurface drainage/irrigation systems. *Irrigation Journal*, 44(4):8,12,14,16-17.

*Subsurface irrigation / Drainage / Irrigation canals / Pumping / Crop-based irrigation / Design criteria / Water table / Monitoring / USA*

(Location: HQ Call No: PER Record No: H 14970)

13877. **Evans, T. 1993.** The rope pump in Bolivia. *Waterlines*, 12(2):6-9.

*Pumps / Bolivia*

(Location: ODI Call No: ODI Journals Record No: L 942452)

13878. **Fahim, W.; El Assiouti, I. 1991.** Management of irrigation delivery system in shallow water table regions. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.103-112.

*Water delivery / Simulation models / Water table / Water requirements / Crop production / Egypt*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14732)

13879. **Fang, X.U.; Singh, V.P. 1994.** Modeling 3D ground-water flow by modified finite-element method. *Journal of Irrigation and Drainage Engineering*, 120(5):892-909.

*Groundwater / Mathematical models / Computer models / Wells*

(Location: HQ Call No: PER Record No: H 15371)

13880. **Feyen, J.; Mwendera, E.; Badji, M. (Eds.) 1992.** Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Leuven, Belgium: Center for Irrigation Engineering. 3 vols.; pp.1-437; 439-858; 859-991.

*Irrigation management / Sustainable agriculture / Land use / Irrigation design / Irrigation systems / Monitoring / Irrigation programs / Simulation models / Water supply / Hydroelectric schemes / Sprinkler irrigation / Surface irrigation / Project appraisal / Water quality / Aquifers / GIS / Evapotranspiration / Water delivery / Conjunctive use / Seepage loss / Irrigation canals / Furrow irrigation / Irrigated farming / Soil salinity / Drainage / Rice / Maize / Large-scale systems / Environmental effects / Farmer participation / Pipes / Irrigation scheduling / Water balance / Monitoring / Computer software / Optimization / Performance indexes / Subsurface drainage / Groundwater / Crop production*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14330)

13881. **Follin, S.; Thunvik, R. 1994.** On the use of continuum approximations for regional modeling of groundwater flow through crystalline rocks. *Advances in Water Resources*, 17(3):133-145.

*Groundwater / Flow / Simulation models / Stochastic process*

(Location: HQ Call No: PER Record No: H 15669)

13882. **Fontaine, T.A.; Todd, D.E. 1993.** Measuring evaporation with ceramic Bellani plate atmometers. *Water Resources Bulletin*, 29(5):785-795.

*Evaporation / Evapotranspiration / Measuring instruments / Monitoring / Calibrations / Water loss / Field tests / USA*

(Location: HQ Call No: PER Record No: H 14068)

**Abstract:** Ceramic atmometers were tested to determine their usefulness for measuring evaporation in water resources applications. Field experiments were used to evaluate the precision, responsiveness to a range of potential evaporation conditions in a forested catchment, and interpretation of water loss of Bellani plate atmometers. The experiments, conducted from April to October in a warm, humid climate in the southeastern United States, indicate that atmometers can be reliable monitoring instruments for estimating potential evaporation. The small size, portability, low internal thermal mass, low cost, and ability to integrate the effect of radiation, air temperature, humidity and windspeed into one direct measurement of potential evaporation, make atmometers a useful instrument for certain water resources applications.

13883. **Foroud, N. 1994.** Management model for sustainable on-farm irrigation. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.1. pp.37-43.

*Irrigation management / Simulation models / Computer models / Irrigated farming / Water conservation / Water management / Sustainability / Evapotranspiration / Soil water / Canada / Alberta*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15414)

13884. **Fraisse, C.W.; Heermann, D.F.; Duke, H.R. 1992.** Modified linear move system for experimental water application. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 1.* Leuven, Belgium: Center for Irrigation Engineering. pp.367-376.

*Research / Water distribution / Irrigation equipment / Flow regulators / Sprinkler irrigation / Mathematical models / Monitoring / Crop-based irrigation*  
(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14366)

**Abstract:** The use of linear move system for experimental water application requires a control much more sophisticated than one for normal field operations. The problem increases in complexity when the field irrigated is divided into small research plots in both advance and lateral directions. The current study investigates the application of the concept of pulse irrigation as a way to apply the different water treatments required in a research field. A laboratory setup was built in which solenoid valves are used to control the flow to each spray head or set of spray heads. Results have shown that pulse irrigation is feasible with commercially available solenoid valves and that water distribution patterns are minimally affected by pulsing the system. They also show that the frequency of operation is limited by the valve's response time which can vary for the different brands and models available in the market.

13885. **Frank, L. 1994.** Don Ackley injects art into the science of irrigation. *Irrigation Journal*, 44(2):24-26, 29.

*Irrigation management / Irrigation practices / Irrigated farming / Water requirements / USA / California*  
Location: HQ Call No: PER Record No: H 14690)

13886. **Frank, L. 1994.** Microsprayers mean macrosavings for almond grower. *Irrigation Journal*, 44(1):14, 16-17.

*Sprinkler irrigation / Water requirements / Plant growth / Crop yield / Water use efficiency / Flood irrigation / USA*  
(Location: HQ Call No: PER Record No: H 14210)

13887. **Frielinghaus, M.; Frielinghaus, M. 1993.** Design and layout of shelter belts in large-area sprinkler-irrigation plants. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: *Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems.* pp.109-118.

*Sprinkler irrigation / Irrigation equipment / Irrigation design / Sandy soils / Erosion / Germany*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15070)

13888. **Galvez, J. 1994.** Discussion on the paper "Technological innovations in irrigated agriculture" In Heim, F.; Abernethy, C.L. (Eds.), *Irrigated agriculture in Southeast Asia beyond 2000: Proceedings of a Workshop held at Langkawi, Malaysia, 5 to 9 October 1992.* Colombo, Sri Lanka: IIMI; DSE. pp.127-129.

*Water delivery / Developing countries / Farmer participation / Irrigation / Organizations / Technology / Philippines*  
(Location: HQ Call No: IIMI 631.7.8 G800 HEI  
Record No: H 15276)

13889. **Gan, T.Y. 1989.** Energy budget and soil water transfer methods using remotely sensed measurements for evapotranspiration studies. In AIT, *Water 30: A commemorative publication on the 30th anniversary of the Division of Water Resources Engineering, Asian Institute of Technology, Bangkok, Thailand, December 1989.* Bangkok, Thailand: AIT. pp.141-164.

*Evapotranspiration / Remote sensing*  
(Location: HQ Call No: 551.48 G000 AIT Record No: H 13784)

13890. **Garbulewski, K.; Wolski, W. 1993.** Damages to irrigation embankment canals constructed with expansive soils. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: *Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems.* New Delhi, India: ICID. pp.979-985.

*Irrigation canals / Soil properties*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15331)

13891. **Garcia, L.A.; Strzepek, K.M.; Podmore, T.H. 1994.** Design of agricultural drainage with adaptive irrigation management. *Journal of Irrigation and Drainage Engineering*, 120(1):179-194.

*Arid lands / Irrigation systems / Drainage / Performance evaluation / Irrigation management / Irrigation scheduling / Waterlogging / Crop yield / Salinity / Computer models / Simulation / Case studies / Egypt*  
(Location: HQ Call No: PER Record No: H 13880)

**Abstract:** This paper describes a new approach to designing field-scale irrigation and drainage systems in arid irrigated areas. This approach

allows for a drainage design that can adjust to irrigation schedules to alleviate waterlogging and salinity problems. This approach has been implemented in a computer model. The computer model contains a feedback loop between the irrigation scheduling and the drainage design components. The modular components of the system are a weather generator, irrigation scheduling, upward flow, salinity of the irrigation water, transient-state drainage design, and crop production. The model modifies the irrigation schedule taking into consideration the effects on the drainage design. The performance of the system is evaluated using the net benefits, as well as explicitly addressing the stochastic nature of irrigation and drainage. The model is constructed so the irrigation and drainage components may be varied individually to study the impact on the whole system. This capability will allow the user to quantify the cost of minimizing drainage water production by modifying the irrigation schedule.

13892. **Gawande, R.L.; Rao, Y.P.; Vanjari, S.S. 1992.** Advance of water front under stream cutoff in irrigation borders. PKV Research Journal, 16(2):249-251.

*Border irrigation / Irrigation design / Mathematical models / India*

(Location: HQ Call No: P 3325 Record No: H 14007)

13893. **Genovez, A.; Abt, S.; Florentin, B.; Garton, A. 1993.** Correction for settlement of parshall flume. Journal of Irrigation and Drainage Engineering, 119(6):1081-1091.

*Flumes / Water resource management / Water measurement / Flow measurement*

(Location: HQ Call No: PER Record No: H 13678)

13894. **Gill, M.S.; Narang, R.S. 1993.** Scheduled irrigation for Gobhi Sarson gives a high yield. Indian Farming, March:35-37.

*Irrigation scheduling / Crop yield / Arid zones / India*

(Location: HQ Call No: P 3002 Record No: H 13729)

13895. **Gilley, J.E.; Kottwitz, E.R.; Wieman, G.A. 1994.** Hydraulic conditions required to move unanchored residue materials. Journal of Irrigation and Drainage Engineering, 120(3):591-606.

*Hydraulics / Sedimentary materials / Flow discharge*

(Location: HQ Call No: PER Record No: H 14418)

**Abstract:** Hydraulic conditions required to initiate movement of unanchored residue materials are identified in the present study. Selected amounts of corn, cotton, pine needles, sorghum, soybean, sunflower, and wheat residue are placed in a flume

on a sand surface, and flow is then introduced at the top of the flume in progressive increments. The discharge rate and flow velocity necessary to cause residue movements are determined. The ratio of critical flow depth to residue diameter, critical Reynolds number, critical shear stress, dimensionless shear stress, and boundary Reynolds number are calculated from hydraulic measurements. Regression equations are developed to relate dimensionless shear stress to boundary Reynolds number and residue diameter. Boundary Reynolds number, in turn, is related to residue diameter and cover. Close agreement is found between predicted and actual parameter values obtained from the regression relations. The regression equations can be used to estimate the beginning of motion for other residue materials if residue diameter and cover are known.

13896. **Gilley, J.R. 1992.** Design and management of center-pivot irrigation systems. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 1. Leuven, Belgium: Center for Irrigation Engineering. pp.347-356.

*Sprinkler irrigation / Design / Irrigation equipment / Mathematical models / Water requirements / Crop-based irrigation*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14364)

**Abstract:** Many types of water application devices are available for use on center-pivot irrigation systems. These consist of an almost infinite number of combinations of sprinkler types or other hardware, nozzle sizes, spacings and pressure requirements. The pivot or end pressure of the system, in conjunction with the water application devices, is primarily selected to conserve energy. However, as the pressure is lowered, the water application rate of the system will generally rise, increasing the probability of runoff of the applied water. A selection procedure to determine the acceptable water application device or devices based upon two different infiltration models is presented. Depending upon the soil type, some form of artificial soil surface storage is required to provide an adequate design for many of the reduced pressure water application devices.

13897. **Godaliyadda, G.G.A. 1994.** The use of computer-operated models as decision-support tools in operation and management of irrigation systems: Sri Lankan experience, Gal Oya System. In Haq, K.A.; Rey, J.; Sakthivadivel, R.; Samarasekera, B.M.S. (Eds.), Use of computer-operated models as decision-support tools in operation and manage-

ment of irrigation systems: Sri Lankan experience - Proceedings of the Workshop on the Use of Computer-Operated Models as Decision-Support Tools in Operation and Management of Irrigation Systems held in Galgamuwa, Sri Lanka from 15 to 16 July 1993. Colombo, Sri Lanka: IIMI. pp.11-12.

*Computer models / Computer software / Decision support tools / Irrigation management / Irrigation operation / Irrigation systems / Irrigation scheduling / Water requirements / Water distribution / Farmers' attitudes / Sri Lanka / Gal Oya Project*

(Location: HQ Call No: IIMI 631.7.1 G744 HAQ Record No: H 15121)

13898. Gosselin, D.C.; Ayers, J.F.; Zhang, Y.K. 1994. Modeling concentration variations in high-capacity wells: Implications for groundwater sampling. *Water Resources Bulletin*, 30(4):613-622.

*Groundwater / Wells / Water quality / Water pollution / Simulation models / USA*

(Location: HQ Call No: PER Record No: H 15675)

13899. Goussard, J. 1993. Automation of canal irrigation systems. New Delhi, India: ICID. vii, 116p.

*Irrigation canals / Canal regulation techniques / Automation / Modernization*

(Location: HQ Call No: 631.7.1 G000 GOU Record No: H 13777)

13900. Goussard, J. 1993. L'automatisation des reseaux d'irrigation en canaux. New Delhi, India: ICID. 168p.

*Irrigation canals / Automation*

(Location: ICID Record No: 26093)

13901. Govindasamy, R. 1991. Univariate box - Jenkins forecasts of water discharge in Missouri river. *Water Resources Development*, 7(3):168-177.

*Water resources / Irrigation water / Flow discharge / Forecasting / Rivers / Mathematical models / USA*

(Location: HQ Call No: P 3324 Record No: H 14006)

13902. Guitjens, J.C. 1993. Alfalfa irrigation during drought. *Journal of Irrigation and Drainage Engineering*, 119(6):1092-1098.

*Drought / Irrigation practices / Crop yield / Sprinkler irrigation / Flood irrigation / Drainage / Mathematical models*

(Location: HQ Call No: PER Record No: H 13679)

**Abstract:** Alfalfa yields decrease when water supply is inadequate. In drought years, starting and continuing with full irrigation until the water supply has been exhausted will limit full production to earlier harvests. The objective of this study was to examine the effect of discontinued irrigation on alfalfa yield during the irrigation

season and when water supply is restored in the following year. Three irrigation levels, water for two harvests (i1), water for 3 harvests (i2), and water for four harvests (i3), were imposed in 1981-83 and one irrigation level (i3) in 1984. Yield response was compared among i1-i3 by harvest for 1981-83 and separately for 1984, between flood and sprinkler irrigation, and between drainage and no drainage. Generally, yields were significantly less for nonirrigation conditions, they fully recovered in 1984 after three years of deficit irrigation, yield of harvests 1 did not differ between 1984 and 1982-83, drainage condition did not affect yield, and irrigation method had a significant influence on yield for harvests 3 and 4 in 1981-83.

13903. Guitjens, J.C.; Goodrich, M.T. 1994. Dormancy and nondormancy alfalfa yield and evapotranspiration. *Journal of Irrigation and Drainage Engineering*, 120(6):1140-1146.

*Evapotranspiration / Water use efficiency*

(Location: HQ Call No: PER Record No: H 15688)

13904. Guitjens, J.C. 1993. Using drainage effluent for irrigation. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century: Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1447-1459.

*Irrigation water / Effluents / Drainage / Water quality / Aquifers / Recycling / Irrigation programs / USA / Nevada*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15489)

13905. Guskov, E. 1991. New concepts and advanced technologies in planning and designing of irrigation development. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. pp.251-258.

*Irrigation design / Technology / Development plans / Mechanization / Automation / Water supply / Water distribution / Irrigation equipment / Pipes / Surface irrigation / Sprinkler irrigation / Water conservation / Russian Federation*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14906)

13906. Hager, W.H.; Schwalt, M. 1994. Broad-crested weir. *Journal of Irrigation and Drainage Engineering*, 120(1):13-26.

*Weirs / Flow channels / Flow measurement / Discharge frequency*

(Location: HQ Call No: PER Record No: H 13876)

**Abstract:** The low features over the broad-crested weir vertical upstream wall and sharp-crested

corner are analysed experimentally. Only the long crested weir is considered, for which the discharge coefficient remains practically constant. For a relative overflow depth between 10% and 40%, the surface profile, the bottom pressure profile, the boundary separation profile, and the velocity profiles close to the upper corner are self-similar, provided effects of scale may be dropped. For extremely long-crested weirs, undular flow occurs. The first wave profile is shown to be identical with the solitary wave profile. The main properties of the undular hydraulic jump are explored. The broad-crested weir is characterized by insensitivity to tailwater submergence. The modular limit is found practically constant at 75% of the tailwater level, independent of the relative head on the weir. The discharge-head relation for submerged flow is analyzed under a novel approach. Finally, recommendations are specified under which a broad-crested weir may be used as a discharge measurement structure.

13907. **Hager, W.H. 1994.** Supercritical flow in circular-shaped side weir. *Journal of Irrigation and Drainage Engineering*, 120(1):1-12.

*Weirs / Flow channels / Irrigation systems*

(Location: HQ Call No: PER Record No: H 13875)

13908. **Hamdi, M.; Durnford, D.; Loftis, J. 1994.** Bromide transport under sprinkler and ponded irrigation. *Journal of Irrigation and Drainage Engineering*, 120(6):1086-1097.

*Sprinkler irrigation / Farm ponds / Groundwater / Water pollution / Soil properties / Chemigation / USA / Colorado*

(Location: HQ Call No: PER Record No: H 15683)

13909. **Hanson, B.R. 1994.** Adhering to the rules of drip tape selection. *Irrigation Journal*, 44(5):8, 11-13.

*Drip irrigation / Water use efficiency / Water distribution*

(Location: HQ Call No: PER Record No: H 15388)

13910. **Hanson, B.R.; Wallender, W.W. 1986.** Bidirectional uniformity of water applied by continuous-move sprinkler machines. In *American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water*, Vol.29. St. Joseph, MI, USA: ASAE. pp.1047-1053.

*Sprinkler irrigation / Irrigation equipment / Irrigation engineering*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13855)

13911. **Hanson, B.R.; Fulton, A.E. 1994.** Methods and economics of drainage reduction through improved irriga-

tion. *Journal of Irrigation and Drainage Engineering*, 120(2):308-321.

*Irrigation management / Economic analysis / Irrigation scheduling / Subsurface drainage / Surface irrigation / Surge irrigation / Furrow irrigation / Drip irrigation / USA / California*

(Location: HQ Call No: PER Record No: H 14097)

**Abstract:** Drainage reduction through improved irrigation is needed for addressing the problem of drainage water disposal in the San Joaquin Valley in California. Options for improving irrigation include improved management of existing systems (irrigation scheduling, duration of water applications), upgrading traditional surface irrigation systems (reduced field length, increased unit flow rate, surge irrigation, furrow compaction, tailwater recovery), and converting to pressurized irrigation systems (hand-move and linear-move sprinklers, low-energy precision application (LEPA) machines and rip irrigation). The most effective upgrade of surface irrigation systems for reducing subsurface drainage is a reduced field length coupled with reduced irrigation times. Increased furrow flow rates resulted in little change in drainage in some cases. Surge irrigation offers an opportunity of reducing subsurface drainage by only about 1/3. Converting to pressurized irrigation methods can substantially reduce subsurface drainage, but may be uneconomical in some cases. Analysis of large-scale field comparisons of irrigation methods revealed that generalizing about the best irrigation method is difficult. Economic analyses of these comparisons showed a well-managed furrow system to be more profitable than a subsurface drip system in one case, but a subsurface drip system to be more profitable compared to a marginally managed furrow system in another case. The analyses also revealed that disposal costs of subsurface drainage water may need to be much higher than projected costs to economically justify converting from furrow irrigation to irrigation systems with high capital costs.

13912. **Haq, K.A.; Rey, J.; Sakthivadivel, R.; Samarasekera, B.M.S. (Eds.) 1994.** Use of computer-operated models as decision-support tools in operation and management of irrigation systems: Sri Lankan experience - Proceedings of the Workshop on the Use of Computer-Operated Models as Decision-Support Tools in Operation and Management of Irrigation Systems held in Galgamuwa, Sri Lanka from 15 to 16 July 1993. Colombo, Sri Lanka: IIMI. xi, 44p.

*Water management / Computer techniques / Computer models / Decision support tools / Calibrations / Hydraulics / Flow measurement / Performance / Irrigation systems / Irrigation programs / Sri Lanka / Gal Oya Project / Kirindi*

*Oya / Polonnaruwa / Uda Walawe / Hakwatuna Oya Project / Magalwewa Scheme / Kantale*  
(Location: HQ Call No: IIMI 631.7.1 G744 HAQ  
Record No: H 15118)

13913. **Hargreaves, G.H. 1993.** Minimum climatic data for irrigation and drainage planning and design. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.157-167.

*Irrigation design / Planning / Drainage / Climate / Rain / Water supply / Data collection / Water requirements / Evapotranspiration / Crop yield / Models*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15074)

13914. **Haribabu, S.; Venugopal, K. 1993.** Management information system for real time operation of an irrigation system. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century. Transactions: Vol.1-G, Symposium. R.4. New Delhi, India: ICID. pp.43-56.

*Management Information Systems / Irrigation systems / Irrigation requirements / Flow control / Rain / Irrigation canals / Reservoirs / Databases / Computer techniques / India / Tamil Nadu*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15731)

13915. **Hasheminia, S.M. 1994.** Controlling runoff under low pressure center pivot irrigation systems. *Irrigation and Drainage Systems*, 8(1):25-34.

*Sprinkler irrigation / Irrigation equipment / Runoff / Water distribution / Tillage / USA / Idaho*  
(Location: HQ Call No: PER Record No: H 15510)

13916. **Haster, T.W.; James, W.P. 1994.** Predicting sediment yield in storm-water runoff from urban areas. *Journal of Water Resources Planning and Management*, 120(5):630-650.

*Sedimentary materials / Runoff water / Mathematical models / Watersheds / Rain / Water quality / USA*  
(Location: HQ Call No: PER Record No: H 15103)

13917. **Hata, T. 1993.** Sustainable development strategies of water resources in river basins. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century. Transactions: Vol.1-G, Special session - Irrigation and drainage in competition for water. New Delhi, India: ICID. pp.49-62.

*River basin development / Water resources development / Sustainability / Water supply / Water reuse / Irrigation water / Paddy fields /*

*Watershed management / Water conservation / Simulation models / Japan*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15721)

13918. **Hathoot, H.M.; Abo-Ghobar, H.M.; Al-Amoud, A.I.; Mohammad, F.S. 1994.** Analysis and design of sprinkler irrigation laterals. *Journal of Irrigation and Drainage Engineering*, 120(3):534-549.

*Sprinkler irrigation / Irrigation design / Water distribution / Pipes / Computer techniques*  
(Location: HQ Call No: PER Record No: H 14414)

**Abstract:** This paper addresses a new design technique for sprinkler irrigation laterals with equally spaced sprinklers and constant longitudinal slope. The technique uses the Darcy-Weisbach friction formula and accounts for the variation of the friction coefficient for the significant practical portion on a Moody diagram. The head loss in sprinkler risers as well as losses in lateral pipe fittings are considered. A computer program employing this technique is designed so as to provide sprinkler outflows and pressure head distributions along the lateral pipe. The results from two numerical examples are compared with results obtained from a widely used classical method. In some cases it is found that designs are substantially different.

13919. **Hebbink, A.J. 1993.** Methods of canal maintenance in the Netherlands. In Jurriens, M.; Jain, K.P. (Eds.), *Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands*. New Delhi, India: ILRI/WALMI. pp.37-53.

*Irrigation canals / Maintenance / Chemical control / Biological control / Weed control / Aquatic weeds / Silt / Netherlands*  
(Location: HQ Call No: 631.7.1 G635 JUR  
Record No: H 15133)

13920. **Heermann, D.F.; Duke, H.R. 1992.** Effective irrigation depth as a function of uniformity. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.1.* Leuven, Belgium: Center for Irrigation Engineering. pp.329-338.

*Sprinkler irrigation / Water control / Water distribution / Infiltration / Simulation / Evaluation / Irrigation efficiency / Irrigation requirements / Mathematical models / Cost benefit analysis / USA*  
(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14362)

**Abstract:** The center pivot irrigator is faced with a problem of determining the appropriate depth of

water application to use for management purposes to minimize both yield loss and water quality degradation. The distribution of irrigation depths of center-pivot systems often is evaluated with the Christiansen Uniformity coefficient. This single coefficient compares systems but does not provide a functional relationship of the variation of applied depths. The analysis of deficit and excess irrigation amounts requires a distribution function. The normal distribution function was found to describe field catch-can tests of center-pivot systems. The current study builds on the work of Peri, Hart, and Norum ('Optimal irrigation depths - A method of analysis.' J. Irrig. and Drg. Div., ASCE 105(IR4): 341-355. 1979), using the normal distribution of application depth and linear yield and economic functions to calculate the appropriate depth of application with known uniformity and user specified economic conditions. The potential savings from improving the uniformity is estimated. The optimum applied depths for center pivot systems vary from 0.6 to 1.5 times the mean depth depending on the system uniformity and management objectives.

13921. **Heermann, D.F.; Duke, H.R.; Buchleiter, G.W. 1994.** Irrigation systems in transition: Center pivots and linear moves. *Irrigation Journal*, 44(2):16-20, 22-23.

*Sprinkler irrigation / Irrigation systems / Irrigation equipment / Irrigation management / Automation / USA*

(Location: HQ Call No: PER Record No: H 14689)

13922. **Hiemcke, A.K. 1992.** Supporting the scheduling task of the system manager: The development of a prototype of a decision support system for the scheduling of water deliveries within canal based irrigation systems, with a case study for the Kirindi Oya system in Sri Lanka. Thesis for Masters Degree in Business Administration, University of Twente, Netherlands. x, 88p.

*Decision support tools / Irrigation scheduling / Irrigation management / Water delivery / Irrigation canals / Computer techniques / Models / Developing countries / Agricultural policy / Case studies / Sri Lanka / Kirindi Oya*

(Location: HQ Call No: IIMI 631.7.1 G744 HIE Record No: H 15166)

13923. **Horrocks, G.; Wimmer, H.L.; McMullin, P. 1994.** Sediment and debris removal inlet structure for canal pipelines. *Journal of Irrigation and Drainage Engineering*, 120(3):606-616.

*Irrigation canals / Sedimentary materials / Flow discharge / Pipes / Sprinkler irrigation / Arid zones / USA / Utah*

(Location: HQ Call No: PER Record No: H 14419)

**Abstract:** New underground pipelines, which replaced open-channel canals in the Duchesne

River area of northeastern Utah, provided the necessary water pressure for local farmers in this arid region to switch to sprinkler irrigation systems. The new pipelines and sprinkler irrigation systems greatly reduced the amount of water previously lost to canal seepage and inefficient flood irrigation. The new pipelines and sprinkler irrigation systems, however, could be easily damaged or clogged by debris and sediment carried in the water. Self-operating, low-maintenance, and low-cost pipeline inlet facilities had to be designed to remove sediment and debris from river water prior to its entering each new canal pipeline. The unique inlet facility designed for the new Tabby Canal pipeline has been operating successfully for four years. It was relatively inexpensive to construct, is completely self-operating, and requires much less maintenance than mechanical inlet facilities. It has functioned so well that there have been no reports of any pipeline or sprinkler damage from water-carried sediment or debris.

13924. **Hossain, S.; Hoque, M.M.; Ahmed, S.M.U. 1994.** Application of rainfall-runoff model NAM in the North-West Region of Bangladesh. *Journal of Irrigation Engineering and Rural Planning*, 27:30-38.

*Rainfall-runoff relationships / Mathematical models / Catchment areas / Calibrations / Bangladesh*

(Location: HQ Call No: PER Record No: H 15514)

13925. **Huang, J.; Wan, Z.; Zhang, Q. 1993.** A study on the sediment transport in an irrigation district. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century: Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1373-1384.

*Sedimentation / Control methods / River basin development / Diversion / Mathematical models / Irrigation programs / Irrigation canals / China / Yellow River*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 13942)

13926. **Hübener, R.; Wolff, P. 1990.** Fortschritte in der technik der oberflächenbewässerung. [Advances in surface irrigation technology] *Kulturtechnik und Landentwicklung*, 31:34-43.

*Surface irrigation / Irrigation practices / Technology / Irrigation equipment / Automation / Computer techniques*

(Location: HQ Call No: P 3381 Record No: H 14197)

**Abstract:** During the last decades traditional surface irrigation systems in irrigated agriculture of arid zones have been improved in order to optimize labor requirements, quality and economy



of water distribution. On-farm water storage tanks, reuse systems, the surge flow concept and intermittent level basin irrigation for large scale cropping other than rice are described. The efforts to mechanize and automate water applications resulted in improved siphon tubes, gates, weirs and completely new hardware like the "cablegation" system. Most useful are modern technical means such as laser-levelling equipment and various programs for microcomputers.

13927. **Humpherys, A.S. 1987.** Automatisation des systemes d'irrigation de surface a la parcelle a travers le monde. New Delhi, India: ICID. viii, 92 refs.

*Surface irrigation / Automation*

(Location: HQ Call No: 631.7.1 G000 HUM Record No: H 13969)

13928. **Humpherys, A.S. 1986.** An automated single-pipe irrigation system. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.185-193.

*Irrigation equipment / Pipes / Irrigation systems / Water conveyance / Water distribution*

(Location: HQ Call No: 631.4 G000 AME Record No: H 2384)

13929. **Humpherys, A.S. 1986.** Energy dissipation in low pressure irrigation pipelines. 1. Butterfly valves and discs. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.1685-1691.

*Pipes / Energy / Irrigation equipment / Irrigation engineering*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13868)

13930. **Humpherys, A.S. 1986.** Evaluation of drop-check structures for farm irrigation systems. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.505-511; 516.

*Small scale systems / Design / Performance evaluation / Hydraulics / Basin irrigation / Erosion*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13849)

13931. **Hurst, B.H. 1994.** The informed irrigator: Using technology selectively. Irrigation Journal, 44(3):26, 29-31.

*Climate / Computer techniques / Computer software / Soil moisture / Irrigation management / Irrigation requirements / Irrigation scheduling / USA/Nebraska*

(Location: HQ Call No: PER Record No: H 14693)

13932. **Imbulana, K.A.U.S. 1994.** Application of computer models in calibration of structures for flow measure-

ment. In Haq, K.A.; Rey, J.; Sakthivadivel, R.; Samarasckera, B.M.S. (Eds.), Use of computer-operated models as decision-support tools in operation and management of irrigation systems: Sri Lankan experience - Proceedings of the Workshop on the Use of Computer-Operated Models as Decision-Support Tools in Operation and Management of Irrigation Systems held in Galgamuwa, Sri Lanka from 15 to 16 July 1993. Colombo, Sri Lanka: IIMI. pp.17.

*Computer models / Computer software / Flow measurement / Calibrations / Sri Lanka*

(Location: HQ Call No: IIMI 631.7.1 G744 HAQ Record No: H 15124)

13933. **INCID. 1994.** Drip irrigation in India. New Delhi, India: INCID. xxiii, 176p.

*Drip irrigation / Small scale systems / Irrigation equipment / Irrigation design / Cost benefit analysis / Policy / Crop production / India*

(Location: HQ, ICID Call No: 631.7.1 G635 INC Record No: H 15596)

13934. **INCID. 1994.** Guide for preparation of plans of operation and maintenance of irrigation systems in India. New Delhi, India: INCID. xvi, 129p. + annex.

*Irrigation operation / Maintenance / Irrigation systems / Strategy planning / Project planning / Legislation / Irrigation management / Organizations / Management Information Systems / Communication / Farmer participation / Training / Financing / Computer techniques / Monitoring / Evaluation / India*

(Location: HQ, ICID Call No: 631.7.1 G635 INC Record No: H 14219)

13935. **India. Ministry of Irrigation. Water Management Division. 1984.** A guide for estimating irrigation water requirements. New Delhi, India: The Ministry. vi, 114p. (Technical series no.2)

*Irrigation requirements / Water requirements / Water use / Evapotranspiration / Evaporation / Rain / Water quality / Irrigation efficiency / Water loss / Water management / Soil-water-plant relationships / India*

(Location: HQ Call No: 631.7.1 G635 IND Record No: H 14840)

13936. **India. Ministry of Water Resources. Water Management Division. 1985.** The water management manual. New Delhi, India: The Ministry. xvi, 281p. (Technical series no.3)

*Water management / Soil surveys / Soil classification / Soil properties / Land classification / Land development / Soil-water-plant relationships / Irrigation systems / Surface irrigation / Sprinkler irrigation / Drip irrigation / Irrigation scheduling / Groundwater / Conjunctive use / Drainage / Handbooks / India*

(Location: HQ Call No: 631.7.1 G635 IND Record No: H 14839)

13937. **Islam, M.N.; Nagai, A.; Yomota, A. 1994.** Real-time flood forecasting in mountainous river basins with long - and short-term runoff model. *Journal of Irrigation Engineering and Rural Planning*, 26:48-66.

*River basins / Runoff / Flood water / Forecasting / Simulation models / Japan*

(Location: HQ Call No: PER Record No: H 14381)

13938. **Jairath, J. 1983.** The paradox of irrigation development in India: A case of conjoint misuse of surface and ground water in Northern India. Research report based on data collected personally through fieldwork during 1980-83. 32p.

*Shallow tube wells / Groundwater / Conjunctive use / Surface water / Canals / Case studies / Irrigation efficiency / India / Punjab*

(Location: HQ Call No: P 3489 Record No: H 14629)

13939. **Jayasundara, B.K. 1994.** Computer model on irrigation water issue scheduling in Kirindi Oya Project. In Haq, K.A.; Rey, J.; Sakthivadivel, R.; Samarasekera, B.M.S. (Eds.), Use of computer-operated models as decision-support tools in operation and management of irrigation systems: Sri Lankan experience - Proceedings of the Workshop on the Use of Computer-Operated Models as Decision-Support Tools in Operation and Management of Irrigation Systems held in Galgamuwa, Sri Lanka from 15 to 16 July 1993. Colombo, Sri Lanka: IIMI. pp.9.

*Computer models / Computer software / Irrigation scheduling / Water requirements / Sri Lanka / Kirindi Oya*

(Location: HQ Call No: IIMI 631.7.1 G744 HAQ Record No: H 15120)

13940. **Jie, Y. 1991.** The operation, management and economical effect of irrigation through plastic flexible hose. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.96-101.

*Irrigation practices / Irrigation systems / Pipes / Water distribution / China*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14918)

13941. **Joung-Mo, L. 1994.** Improved operation and maintenance of lift irrigation systems in South Korea. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.172-177.

*Water lifting / Irrigation operation / Maintenance / Groundwater irrigation / Tube wells / Korea Republic*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14872)

13942. **Jurriëns, M.; Wolters, W. 1993.** Can protective irrigation be more efficient? Paper presented at the International Conference on Hydrology and Water Resources, Delhi, India, December 1993. 11p.

*Protective irrigation / Irrigation systems / Irrigation efficiency / Irrigation canals / Irrigation design / Water allocation / India / Karnataka / Tungabhadra System*

(Location: HQ Call No: P 3577 Record No: H 15169)

13943. **Jurriëns, M.; Jain, K.P. (Eds.) 1993.** Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands. New Delhi, India: ILRI/WALMI. vi, 251p.

*Irrigation systems / Drainage / Maintenance / Irrigation canals / Silt / Weed control / Irrigation equipment / Drains / Financing / Cost recovery / Farmer participation / India / Netherlands / Sudan / Gezira Scheme*

(Location: HQ, ICID Call No: 631.7.1 G635 JUR Record No: H 15130)

13944. **Jury, W.A.; Sinai, G.; Stolzy, L.H. 1980.** A proposal for reclamation by dilution of irrigation water. *Irrigation Science*, 1:161-168.

*Soil salinity / Water quality / Irrigation water / Models / Leaching / Simulation*

(Location: HQ Call No: P 3307 Record No: H 13951)

13945. **Kabala, Z.J. 1994.** The dipole flow test: A new single borehole test for aquifer characterization. *Water Resources Journal*, March:40-50.

*Aquifers / Models*

(Location: ODI Record No: L 942942)

13946. **Kamra, S.K.; Rao, K.V.G.K. 1994.** Modelling long-term impacts of sub-surface drainage in India. *Grid*, 4:8-9.

*Subsurface drainage / Simulation models / Waterlogging / Soil salinity / India*

(Location: HQ Call No: P 3338 Record No: H 14025)

13947. **Karatzas, G.P.; Pinder, G.F. 1993.** Groundwater management using numerical simulation and the outer approximation method for global optimization. *Water Resources Research*, 29(10):3371-3378.

*Groundwater management / Simulation models / Mathematical models*

(Location: HQ Call No: PER Record No: H 13686)

**Abstract:** Groundwater quantity management problems with fixed charges have been formulated in the past as mixed integer and linear programming problems. In this paper a new methodology is presented where the fixed charges are incorporated into the objective function in an exponential form and the problem is solved as a

concave minimization problem. The principal difficulty in the minimization of a concave function over a linear or nonlinear set of constraints is that the local minima which are determined by the classical minimization algorithms may not be global. In an effort to circumvent this problem the outer approximation method is introduced. This method is applicable to the global minimization of a concave function over a compact set of constraints. In the present work the outer approximation is applied to concave minimization problems over a convex compact set of constraints. Two applications of the method to groundwater management problems are presented herein, and the results are compared with an existing solution obtained using a different optimization approach.

13948. **Kato, K. 1988.** Analysis of the conventional methods and development of a new procedure: On-farm development in developing countries (I) Irrigation Engineering and Rural Planning, 14:16-32.

*Farm management / Project design / Development projects / Irrigation design / On farm research / Developing countries*

(Location: HQ Call No: IIMI 631.7.1 G000 KAT  
Record No: H 14002)

13949. **Kato, K. 1989.** Application of a new procedure to a project, and discussion: On-farm development in developing countries (II) Irrigation Engineering and Rural Planning, 15:5-23.

*Farm management / Project design / Development projects / Irrigation design / On farm research / Developing countries*

(Location: HQ Call No: IIMI 631.7.1 G000 KAT  
Record No: H 14003)

13950. **Kato, K. 1991.** Concreting in tropical countries: A case study in a semi-arid region. Irrigation Engineering and Rural Planning, 21:29-48.

*Concrete / Irrigation programs / Drainage / Construction technology / Case studies / Japan*

(Location: HQ Call No: P 3393 Record No: H 14217)

13951. **Katopodes, N.D. 1994.** Hydrodynamics of surface irrigation: Vertical structure of the surge front. Irrigation Science, 15(2/3):101-111.

*Surface irrigation / Mathematical models / Simulation / Flow*

(Location: HQ Call No: PER Record No: H 15691)

13952. **Kawaguchi, K. 1994.** Pumping for irrigation and drainage. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.42-60.

*Pumping / Irrigation practices / Drainage*

(Location: HQ Call No: 631.7.6.3 G750 FAO  
Record No: H 14861)

13953. **Keïta, A. 1994.** DIG V1.1: Logiciel de calcul de débits et de volumes d'eau à partir de mesures chronologiques de hauteurs d'eau sur les orifices et les déversoirs. Ouagadougou, Burkina Faso: IIMI. iv, 53p.

*Computer software / Water distribution / Flow discharge / Weirs / Water measurement / Reservoirs / Burkina Faso*

(Location: HQ Call No: IIMI 631.7.1 G226 KEI  
Record No: H 14519)

**Abstract:** The efforts of IIMI/PMI-BF to assess irrigation water use from small reservoirs in Burkina Faso led to the development of a software called DIG. This program, written in Quick Basic 4.5, is a simple data processing tool which respects the international norm CUA (Common User Access) that greatly facilitates learning new software. The version 1.1 of DIG, presented in this paper, allows the calculation of discharges and volumes of water from chronological measurements of water depths over rectangular orifices and weirs. The results are generated either as "elementary volumes" (i.e. function of the chronological structure of input data), or any other time step e.g. daily, 2 days, 5 days... All the input data and the output results can be easily printed. Furthermore, it is possible to export the results towards spreadsheet software like Quattro Pro or Lotus 123 for producing graphics or performing other calculations.

13954. **Kelso, G.L.; Gilley, J.R. 1986.** A system for measuring infiltration rates under center-pivot irrigation systems. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.1058-1064.

*Irrigation systems / Infiltration / Sprinkler irrigation / Irrigation equipment / Design / Irrigation engineering / Runoff*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13857)

13955. **Kezong, X. 1993.** Effects of water saving irrigation techniques in some areas of China. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-G, Special session - Irrigation and drainage in competition for water. New Delhi, India: ICID. pp.63-73.

*Water conservation / Irrigation practices / Water demand / Water supply / Water shortage / Sprinkler irrigation / Water conveyance / Pipes / Small scale systems / China*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15722)

13956. **Khan, H.R. 1994.** Operation and maintenance of lift irrigation systems in Bangladesh. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September – 1 October 1993. Bangkok, Thailand: FAO. pp.81–91.

*Water lifting / Irrigation practices / Low lift irrigation / Water market / Tube wells / Bangladesh*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14863)

13957. **Kim, C.S.; Moore, M.R.; Hanchar, J.J.; Nieswiadomy, M. 1989.** A dynamic model of adaptation to resource depletion: Theory and an application to groundwater mining. *Journal of Environmental Economics and Management*, 17(1):66–82.

*Groundwater extraction / Mathematical models / Aquifers / Common property / Crop production / Cotton / Sorghum / Water allocation / USA / Texas*

(Location: HQ Call No: P 3606 Record No: H 15293)

13958. **King, B.A.; Busch, J.R. 1993.** Computer model for on-farm irrigation system planning. *Agricultural Water Management*, 24:239–248.

*Computer models / Simulation models / Irrigation systems / Management planning / Case studies / USA*

(Location: HQ Call No: P 3376 Record No: H 14192)

**Abstract:** A microcomputer model is developed for use as a planning tool to aid in the sequence of development, evaluation and selection of the best alternative on-farm irrigation system plan. The model is used to predict operation of an on-farm irrigation system under given site-specific conditions and select the best system plan from a set of alternatives. The best system plan is selected based on maximization of annualized net returns to land and management. Application of the model to a case study is presented. The consequences of limitations in water, energy and labor used and/or different economic scenarios are evaluated as it concerns system plan selection.

13959. **Kobayashi, T.; Promnaret, S.; Usuki, N.; Horii, K. 1994.** A model water management information network system in the Central Plain of Thailand. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16–20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.56–67.

*Water management / Information systems / Networks / Databases / Management Information Systems / Computer techniques / Thailand*

(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15201)

13960. **Kos, Z. 1992.** Sustainable irrigation planning under the climatic changes. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management*, Leuven, Belgium, 14–17 September 1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.193–202.

*Water supply / Climate / Mathematical models / Irrigation management / Sustainability / Water requirements / Evapotranspiration*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14349)

**Abstract:** The problem of future water supply-demand integration are central to climate impact assessment and particular concern to many states of the world. The development of agricultural systems and their adaptive management strategies are considered. The adjustment in regional pattern for agriculture could be triggered by the climate change and the agricultural and economic prospects at the farm, regional or state level can be affected. Sustainable development of irrigation is closely related to water resources systems. Both these objectives use mathematical optimization and simulation models and computer software. The principle of relating irrigation water requirements to meteorological factors is a physically based mathematical model calibrated on observation of measured withdrawals of large irrigation systems. The nations may be involved by the social, economic, and climatic changes in a different manner and the possible reaction may also differ. Therefore the planning policy may be different and the sustainable irrigation planning may involve also the political aspects.

13961. **Kosugi, K. 1994.** Three-parameter lognormal distribution model for soil water retention. *Water Resources Research*, 30(4):891–901.

*Soil water relations / Mathematical models / Soil moisture*

(Location: HQ Call No: PER Record No: H 14675)

13962. **Krinner, W.; García, A.; Estrada, F. 1994.** Method for estimating efficiency in Spanish irrigation systems. *Journal of Irrigation and Drainage Engineering*, 120(5):979–986.

*Irrigation systems / Irrigation efficiency / Water conveyance / Water distribution / Water loss / Crop production / Water costs / Spain*

(Location: HQ Call No: PER Record No: H 15378)

13963. **Kumar, S.; Bastiaanssen, W.G.M. 1993.** Simulation of the water balance in relation to crop water require-

ments in (semi) arid zones. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.349-363.

*Water balance / Soil moisture / Water requirements / Soil-water-plant relationships / Arid zones / Simulation models / Computer models / Irrigation efficiency / Drainage / India / Haryana*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15088)

13964. **Kuzniar, A. 1993.** Effects of wind on sprinkler system performance. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.627-635.

*Sprinkler irrigation / Performance evaluation / Environmental effects / Sudan / Nigeria*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15233)

13965. **Lambert, R.A. 1993.** The need for and design of a pressurized discharge human-powered treadle pump. Water Resources Journal, 176:90-97.

*Manual pumps / Design / Water lifting / Groundwater. / Africa / Zimbabwe*  
(Location: HQ Call No: PER Record No: H 14057)

13966. **Lamont, W.J. 1994.** On the move with portable micro-irrigation systems. Irrigation Journal, 44(4):26,30-31.

*Irrigation systems / Small scale systems / Irrigation equipment / Drip irrigation / Irrigated farming / USA*  
(Location: HQ Call No: PER Record No: H 14972)

13967. **Latif, M.; Sarwar, S. 1994.** Proposal for equitable water allocation for rotational irrigation in Pakistan. Irrigation and Drainage Systems, 8(1):35-48.

*Water allocation / Water delivery / Water distribution / Equity / Mathematical models / Pakistan*  
(Location: HQ Call No: PER Record No: H 15511)

13968. **Latif, M. 1993.** Water allocation and distribution dilemma at farm level. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1071-1081.

*Water allocation / Water distribution / Water delivery / Equity / Open channels / Mathematical models / Pakistan / India*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15339)

13969. **Latifi, H.; Prasad, S.N.; Helweg, O.J. 1994.** Air entrapment and water infiltration in two-layered soil column. Journal of Irrigation and Drainage Engineering, 120(5):871-891.

*Infiltration / Soil water relations / Soil moisture / Mathematical models*  
(Location: HQ Call No: PER Record No: H 15370)

13970. **Lawrence, P.; Ahmed, A.S.; Russell, J. 1993.** Deposition of fine sediments in irrigation canals. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century: Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1331-1344.

*Irrigation canals / Design / Sedimentation / Control methods / Models*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 13528)

13971. **Le Van Hien. 1994.** Water lifting devices development in Vietnam. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.249-252.

*Water lifting / Irrigation operation / Maintenance / Pumps / Vietnam*  
(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14883)

13972. **Lebdi, F.; Zayani, K.; Ennabli, N.; Tarhouni, J. 1993.** Modele d'equilibrage des reseaux d'irrigation des oasis en Tunisie. [Hydraulic equilibrium model of an oasis network irrigation system in Tunisia] In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.603-613.

*Irrigation systems / Networks / Oases / Hydraulics / Models / Tunisia*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15230)

13973. **Leijnse, A.; Hassanizadeh, M. 1994.** Model definition and model validation. Advances in Water Resources, 17(3):197-200.

*Groundwater / Models*  
(Location: HQ Call No: PER Record No: H 15671)

13974. **Letey, J.; Dinar, A.; Knapp, K.C. 1985.** Crop-water production function model for saline irrigation wa-

ters. Soil Science Society of America Journal, 49(4):1005-1009.

*Irrigation water / Salinity / Crop yield / Water requirements / Models*

(Location: HQ Call No: P 3284 Record No: H 13819)

13975. Ley, T.W. 1994. An in-depth look at soil water monitoring and measurement tools. Irrigation Journal, 44(3):8, 11-14, 16-20.

*Soil water / Water management / Water measurement / Monitoring / Soil moisture*

(Location: HQ Call No: PER Record No: H 14692)

13976. Ley, T.W. 1994. Raising the energy efficiency of irrigation pump systems. Irrigation Journal, 44(2):8, 11-15.

*Pumps / Energy / Irrigation equipment / Irrigation efficiency / Maintenance*

(Location: HQ Call No: PER Record No: H 14688)

13977. Liedl, R. 1994. A conceptual perturbation model of water movement in stochastically heterogeneous soils. Advances in Water Resources, 17(3):171-179.

*Soil water movement / Soil water relations / Flow / Mathematical models / Stochastic process*

(Location: HQ Call No: PER Record No: H 15670)

13978. Liu, F.; Feyen, J.; Berlamont, J. 1994. Downstream control algorithm for irrigation canals. Journal of Irrigation and Drainage Engineering, 120(3):468-483.

*Irrigation canals / Downstream control / Simulation models*

(Location: HQ Call No: PER Record No: H 14410)

**Abstract:** A downstream control algorithm for on-demand operation of irrigation canal system is presented. A constant water level is maintained at the downstream end of the pool. The approach is based on an explicit finite-difference solution procedure of the St. Venant equations. The upstream gate settings are corrected according to the water level and the flow rate at the information nodes along the canal. The method is illustrated for the control of a canal pool bounded by an upstream gate and a downstream gate or pump. The effectiveness of the control has been tested using an unsteady-flow simulation model that is based on the complete St. Venant equations and the implicit Preissmann scheme. The simulation results show that the proposed control method can cope with rapid variations of water demand and unknown disturbances in the system. The influence of the number of information nodes and assessment of the physical parameters of the system on the response of the system has been investigated. Unless the estimated physical

parameters of the system are too far from their actual values, an effective control can be achieved by measuring the water level and estimating the flow rate only at the most upstream and downstream ends of the pool.

13979. Liu, F.; Feyen, J. 1993. Modular approach of computer aided design of irrigation and drainage systems. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.555-567.

*Computer techniques / Computer software / Irrigation design / Subsurface drainage / Irrigation canals*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15227)

13980. Liu, F.; Feyen, J.; Berlamont, J. 1992. Prescribed transient control in series channel. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.495-503.

*Open channels / Simulation / Mathematical models*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14430)

13981. Liu, Y.; Steenhuis, T.S.; Yves Parlange, J. 1994. Closed-form solution for finger width in sandy soils at different water contents. Water Resources Research, 30(4):949-952.

*Sandy soils / Groundwater / Pollution / Soil water / Models*

(Location: HQ Call No: PER Record No: H 14676)

13982. Lo, K.F.A. 1994. Quantifying soil erosion for the Shihneb Reservoir watershed, Taiwan. Agricultural Systems, 45(1):105-116.

*Erosion / Reservoirs / Watersheds / Computer techniques / Simulation models / GIS / Sedimentation / Taiwan*

(Location: HQ Call No: PER Record No: H 4765)

**Abstract:** The AGNPS model is a microcomputer program capable of modeling the erosion process and simulating the water erosion and transport of sediment, nutrients and flow for watersheds ranging from 1 to 50 000 ha size. With proper modifications of the universal soil loss equation factors, excellent agreements between the simulated and measured sediment yields were obtained for the Shihmen Reservoir watershed. The model input data were collected initially by

the technique of remote sensing and geographic information system, and processed with the ARC/INFO Geographic Information System software. The predicted sedimentation depth for the watershed averages about 2.5 mm/year, which is not significantly different from the observed rate, but exceeds what is observed in the US. It is, therefore, necessary to prescribe appropriate soil and water conservation practices to control the sedimentation problem in reservoir watersheds in Taiwan.

13983. **Lu, N. 1994.** A semianalytical method of path line computation for transient finite-difference groundwater flow models. *Water Resources Research*, 30(8):2449-2459.

*Groundwater / Flow / Velocity / Mathematical models*

(Location: HQ Call No: PER Record No: H 15501)

13984. **Lunzhang, S. 1994.** Improved operation and maintenance of lift irrigation systems in China. In *FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation*, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.114-118.

*Water lifting / Irrigation operation / Maintenance / China*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14867)

13985. **Lyle, W.M.; Bordovsky, J.P. 1986.** Multifunction irrigation system development. In *American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water*, Vol.29. St. Joseph, MI, USA: ASAE. pp.512-516.

*Irrigation systems / Irrigated farming*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13850)

13986. **Maheshwari, B.L. 1994.** Development of a regression-based model of border irrigation on cracking soils. *Agricultural Water Management*, 25(2):167-178.

*Border irrigation / Mathematical models / Simulation models / Soil properties / Australia*

(Location: HQ Call No: PER Record No: H 14270)

13987. **Maheshwari, B.L. 1993.** Issues in border irrigation design and management in Australia. In *ICID, 15th International Congress on Irrigation and Drainage*, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.997-1005.

*Border irrigation / Irrigation design / Irrigation management / Simulation models / Soil properties / Australia*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15333)

13988. **Maheshwari, K.M. 1993.** Changing maintenance requirements as a result of irrigation developments. In *Jurriens, M.; Jain, K.P. (Eds.), Maintenance of irrigation and drainage systems Practices and experiences in India and the Netherlands*. New Delhi, India: ILRI/WALMI. pp.147-152.

*Maintenance / Irrigation management / Irrigation canals / Siltation / Farmers' attitudes / India / Uttar Pradesh*

(Location: HQ Call No: 631.7.1 G635 JUR Record No: H 15140)

13989. **Maheshwari, K.M. 1993.** Problems in maintenance of lined canals. In *Jurriens, M.; Jain, K.P. (Eds.), Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands*. New Delhi, India: ILRI/WALMI. pp.165-168.

*Irrigation canals / Canal linings / Maintenance / India*

(Location: HQ Call No: 631.7.1 G635 JUR Record No: H 15142)

13990. **Maheshwari, K.M.; Jain, K.P. 1993.** Some tips on drain maintenance. In *Jurriens, M.; Jain, K.P. (Eds.), Maintenance of irrigation and drainage systems Practices and experiences in India and the Netherlands*. New Delhi, India: ILRI/WALMI. pp.171-175.

*Maintenance / Irrigation canals / Drainage / Drains / Siltation / India*

(Location: HQ Call No: 631.7.1 G635 JUR Record No: H 15143)

13991. **Makin, I.W.; Bird, J.D. 1993.** An intermediate level of data processing for irrigation management. In *ICID, 15th International Congress on Irrigation and Drainage*, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-G, Symposium. R.2. New Delhi, India: ICID. pp.17-30.

*Irrigation management / Data processing / Computer techniques / Simulation models / Water requirements / Databases / Water distribution / Monitoring / Decision support tools / Sri Lanka / Thailand*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15729)

13992. **Malaterre, P.O. 1994.** Modélisation, analyse et commande optimale LQR d'un canal d'irrigation. Montpellier Cedex, France: CEMAGREF. 220p. (Etudes - Equipements pour l'eau et l'environnement no.14)

*Irrigation canals / Canal regulation techniques / Flow control / Regulated flow / France / USA*

(Location: HQ Call No: D 631.7.1 G906 MAL Record No: H 15519)

**Abstract:** Doctoral thesis presented to ENGREF (Ecole National du Genie Rural, des Eaux et des Forêts), 27 January 1994. Methods of automatic

control have been developed for irrigation canals since 1970, mainly in France and USA. These methods can be classified according to four concepts: Controlled variables, control logic, design method and implementation. Optimal control, a multivariable method, is developed in this thesis. The required linear model is obtained from Saint-Venant equations, discretised with Preissmann implicit scheme. One advantage of this scheme is not to be constrained by Courant condition. A special modelisation is used for boundary conditions, in order to obtain a controllable system and to limit input velocities. A method is presented that evaluates the modelisation and control time step. The optimal controller can address tracking issues and use prediction of offtake withdrawals. A complete and reduced order state observer are proposed. A perturbation observer is also defined, reconstructing unknown offtake withdrawals and therefore improving the state reconstruction. A method is suggested that initialises the weighting matrices. The optimal controller and the reduced observer are tested on two examples: A low and a high head loss canal reach. Robustness is evaluated, by simulation on a degraded system. Results prove the controller and the observer to be very satisfactory. Finally, results are compared, to other well-known regulation methods.

13993. **Mangano, A.; Strampelli, E. 1991.** Methodologies of quantifying surface water resources for the development of spate irrigation projects in semiarid areas. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. pp.35-44.

*Spate irrigation / Surface water / Water resources / Irrigation programs / Models / Rain / Runoff / Sudan*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14889)

13994. **Manges, H.L. 1994.** Automating surface irrigation today, and tomorrow. Irrigation Journal, 44(1):18-20, 22-23.

*Surface irrigation / Furrow irrigation / Pipes / Automation / Open channels / Surge irrigation / Runoff water / USA*

(Location: HQ Call No: PER Record No: H 14211)

13995. **Mannocchi, F.; Mecarelli, P. 1994.** Optimization analysis of deficit irrigation systems. Journal of Irrigation and Drainage Engineering, 120(3):484-503.

*Irrigation water / Crop-based irrigation / Crop yield / Mathematical models / Optimization / Stochastic process / Water deficit / Soil Water / Italy / Tiber Valley*

(Location: HQ Call No: PER Record No: H 14411)

**Abstract:** In the present paper the use of mathematical programming theory is proposed to define optimization criteria for the deficit irrigation of an area. A first application, which was carried out on a simple farm in the Upper Tiber Valley (Central Italy), gave significant results. By using multiplicative Stewart's formula, it was possible to determine, for various crops, the relationships between crop yield and applied water, which depend on the deterministic component of the process of water exchange soil-crop-atmosphere. The stochastic component of the same process is defined by the hypothesis that the functions are variable from year to year. These relationships were introduced as a constraint in the mathematical programming framework, with the aim of optimizing, in economic terms, the application of available irrigation water taking into account the possibility of varying the crop pattern. Finally since the optimal solution can be found only on an annual basis, due to the stochastic component of the process, an attempt was made to define a method for determining a single, constant and optimal solution.

13996. **Manz, D.H. 1991.** Eastern irrigation district water delivery management/operation improvement project. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.147-157.

*Irrigation canals / Simulation models / Water delivery / Water management / Irrigation programs / Water conveyance / Canada / Alberta (Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14736)*

13997. **Marek, T.H.; Undersander, D.J.; Ebeling, L.L. 1986.** An areal-weighted uniformity coefficient for center pivot irrigation systems. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.1665-1667.

*Sprinkler irrigation / Irrigation systems*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13865)

13998. **Martínez, P.; Mundo, M.; Carrillo, M. 1994.** Measurement devices for irrigation water. Water Resources Development, 10(3):339-350.

*Water use efficiency / Water measurement / Flumes / Computer techniques / Design / Open channels / Wells / Technology transfer / Mexico*

(Location: HQ Call No: PER Record No: H 15474)

**Abstract:** Efficient water use and aquifer conservation require accurate measurement of the water used in both gravity and pressurized irrigation systems. Volumetric irrigation delivery is very important for any conservation policy. A large number of measurement devices must be



placed in both open channels and closed conduits in the irrigation system to achieve this goal, and in Mexico it must be done quickly because of the new water law. The Mexican Institute of Water Technology created a program to develop measuring devices but in addition a broad and effective program of technology transfer was needed, including the development of specialized software, and also training courses and workshops. This paper presents the volumetric channel and well (closed conduit) flowmeters and the main components of the technology transfer program thanks to which these devices, in the short period of two years, entered into general use in Mexico.

13999. **Masumoto, T.; Sato, H. 1993.** Optimal network design of drainage facilities by dynamic programming. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.825-835.

*Irrigation design / Drainage / Decision making / Water control / Models / Runoff / Japan / Shirone Basin*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15249)

14000. **Mathewson, I. 1993.** The rebirth of the hydraulic ram pump. *Waterlines*, 12(2):10-14.

*Pumps*

(Location: ODI Call No: ODI Journals Record No: L 942453)

14001. **Mawardi, M. 1990.** Alternative improvement of time allocation in rotational irrigation based on canal performance. Paper presented at the Workshop on Irrigation Management Improvement in Rice-based Cropping Systems, 13-14 June 1990, Yogyakarta, Indonesia. i, 12p. (Irrigation management improvement for rice based farming system series, 1988/1989)

*Irrigation canals / Canal regulation techniques / Water distribution / Water allocation / Water delivery / Irrigation programs / Indonesia / West Java*

(Location: HQ Call No: IIMI 631.7.1 G673 MAW Record No: H 15159)

**Abstract:** (DAE/GMU-IIMI Collaborative Research Program (No.937-INO-IIMI-ADB), Gadjah Mada University, Bulaksumur, Yogyakarta, Indonesia).

14002. **Mawardi, M. 1990.** Evaluation of canal performance for delivering irrigation water in rice-based cropping system. DAE/GMU-IIMI Collaborative Research Program (No.937-INO-IIMI-ADB), Gadjah Mada University, Bulaksumur, Yogyakarta, Indonesia. 27p. (Irrigation management improvement for rice based farming system series, 1988/1989)

*Irrigation canals / Flow control / Crop-based irrigation / Rice / Water distribution / Water allocation / Irrigation programs / Performance evaluation / Indonesia / West Java*

(Location: HQ Call No: IIMI 631.7.1 G673 MAW Record No: H 15160)

14003. **Mazion, E.; Yen, B.C. 1994.** Computational discretization effect on rainfall-runoff simulation. *Journal of Water Resources Planning and Management*, 120(5):715-734.

*Rainfall-runoff relationships / Simulation models / Computer techniques / Catchment areas / Computer software / Australia*

(Location: HQ Call No: PER Record No: H 15106)

14004. **McDonald, C.; Rickard, C.E. 1993.** Diversion of the River Calder at Welbeck: An engineering and environmental challenge. In Currie, J.C.; Pepper, A.T. (Eds.), *Water and the environment*. Chichester, UK: Ellis Horwood. pp.264-275.

*Environmental effects / Diversion / Rivers / Hydrology / Erosion / Weirs / UK*

(Location: HQ Call No: 333.91 G000 CUR Record No: H 15017)

14005. **McKenney, R.A.; Gardner, T.W. 1994.** Gully erosion minimization on reclaimed surface mines using SSAST computer model. *Journal of Irrigation and Drainage Engineering*, 120(5):910-924.

*Computer models / Infiltration / Hydrology / Sedimentation / Rainfall-runoff relationships / Erosion / USA / Pennsylvania*

(Location: HQ Call No: PER Record No: H 15372)

14006. **Merriam, J.L. 1992.** Flexible on-farm schedules affect system capacity, operation and cost. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 1.* Leuven, Belgium: Center for Irrigation Engineering. pp.157-171.

*Irrigation scheduling / Water delivery / Design / Irrigation canals*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14346)

**Abstract:** With the acceptance and understanding by engineers, planners, and financiers of the great value at the on-farm level of a flexible irrigation water supply system, they need to be aware of its effect on the system's capacity, operation and cost. It is shown that relative to a rotation schedule, the flexible supply schedules need: (1) much larger capacity in the lower portions distributing water to

the farm outlets; (2) possibly slightly larger or more probably smaller capacity in the upper and central portions of the project main supply system; (3) storage capacity in reservoirs or in-canal to simplify day to night and operation flow rate changes; (4) a fair to large degree of system automation involving level top canals and automatic float controlled gates or other automation techniques; (5) an appreciable use of 200 mm to moderate size concrete pipe often involving the use of float valves for semi-closed system designs for automation; (6) the possible use of low lift pumps; (7) simpler operation procedures but needing operators of a higher level of technical training; (8) farmer involvement through an organized Water Users Association; (9a) Appreciable increase in capital cost in the distribution area when pipelines are used rather than earth ditches (50% to 75%) and (9b) appreciable decrease when pipelines are used rather than lined ditches (20 to 40%); (10) small increase in overall total project cost (10-20%); and result in (11) very appreciable increase in crop production due to upgrade farm management capability; (12) greatly increased project repayment capability; and (13) very greatly increased farmer satisfaction and support.

14007. **Merriam, J.L. 1992.** Flexible water supply systems facilitated by low pressure semi-closed and closed pipeline systems. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management*, Leuven, Belgium, 14-17 September 1992. Vol. 1. Leuven, Belgium: Center for Irrigation Engineering. pp.173-183.

*Water delivery / Concrete pipes / Design / Surface irrigation / USA / India / California / Madhya Pradesh*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14347)

**Abstract:** Low pressure closed and semi-closed pipelines are nearly the only practical way to deliver irrigation water with flexible scheduling for surface irrigation. The use of float valves is essential for the semi-closed system where gravity developed head is excessive. The Harris float valve with over forty years of application, is the most widely used one. In conjunction with low pressure non-reinforced concrete pipe, it provides a low cost delivery system. The design concept and procedures for its use are illustrated.

14008. **Merriam, J.L. 1992.** The need on the farm for a flexible water supply schedule. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and*

management of irrigation systems as related to sustainable land use: *Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management*, Leuven, Belgium, 14-17 September 1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.147-156.

*Water supply / Farming systems / Irrigation scheduling*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14345)

**Abstract:** To optimize crop production and farmer welfare, it is necessary to make the best use of his land, water, weather, labor and management resources. Restraints on the water supply inhibit the effective use of these resources. The alleviation of restraints permits optimization and the maintenance of a sustainable irrigated agriculture. Rotation irrigation schedules fixed in frequency, rate and duration inhibit management capabilities, force inefficient use of water and labor, reduce crop production, limit the effective use of rainfall, and frequently relate to high water table and drainage problems. A flexible water supply permitting a limited rate demand or arranged schedule under control of the farmer at the point of application, is essential to optimize irrigated farming operations. A flexible water supply that permits the farmer to manage his total farming operation with irrigation as one conforming aspect rather than inflexibility dominating, permits application of water: at a frequency related to the crop-soil-water-evapotranspiration needs to not stress the crop and to optimize production and at a time to conform to cultural requirements, rainfall, and labor availability and convenience; at a rate that utilizes labor effectively, conforms to the field size, method and intake rate, and is modifiable as needed; and for a duration that allows enough water to be infiltrated but can be turned off when enough has been applied.

14009. **Merriam, J.L. 1992.** Pilot projects demonstrate the value of flexible on-farm water supply schedules. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management*, Leuven, Belgium, 14-17 September 1992. Vol. 1. Leuven, Belgium: Center for Irrigation Engineering. pp.185-192.

*Water supply / Irrigation scheduling / Water distribution / Pipes / Agricultural extension / Farmer participation / Sri Lanka / Pakistan*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14348)

**Abstract:** The use of pilot projects in developing and presenting new information about irrigated agriculture and in educating farmers, engineers, planners and financiers is discussed. Illustrations are presented demonstrating the development and use of flexible irrigation systems and schedules to assist in establishing sustainable irrigation agriculture. Information is also presented from established pilot projects as to the value of flexible irrigation schedules, the use of semi-closed pipeline systems with automated float valves, level top canals with float activated downstream control gates, reservoirs and in-canal storage, and reregulated operational spillage to automate sloping canals. Also shown is the on-farm and project values and benefits of the flexible schedules in increasing crop production, reducing over irrigation and high water table - drainage - salinity problem, and reducing labor and making it more convenient.

14010. Mielke, L.N.; Gilley, J.R.; Wilhelm, W.W. 1992. Low pressure center pivot and soil management effects on runoff. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 1. Leuven, Belgium: Center for Irrigation Engineering. pp.357-366.

*Sprinkler irrigation / Soil management / Runoff / Rainfall-runoff relationships / Maize*

(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14365)

14011. Mihic, D. 1992. The role of real time control in irrigation channel design and management. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 1. Leuven, Belgium: Center for Irrigation Engineering. pp.255-264.

*Open channels / Flow control / Control systems / Mathematical models / Simulation / Irrigation design*

(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14354)

**Abstract:** This paper discusses the introduction of control system in design technology which enable better assessment of irrigation channel systems' operation under real conditions. The open channel network configuration and its control system are closely connected. This means that the control

system must suit the configuration, but the configuration also depends on the control system. Therefore, the analysis of their interaction is very important. In this approach to the irrigation channel design it is not acceptable to make a final decision on which systems configuration to adopt before the control system has been successfully applied. An important part of the overall process is to provide an appropriate mathematical model of the irrigation channel network.

14012. Minae, S.; Ubels, J. 1993. Tuning irrigation systems to their social environment: Towards an improved design method. In Ubels, J.; Horst, L. (Eds.), Irrigation design in Africa: Towards an interactive method. Wageningen, Netherlands: Wageningen Agricultural University. pp.13-21.

*Irrigation design / Social aspects / Africa*

(Location: HQ Call No: 631.7.1 G100 UBE  
Record No: H 13911)

14013. Mishra, S.; Guyonnet, D. 1993. Analysis of observation-well response during constant-head testing. Water Resources Journal, 178:64-70.

*Aquifers / Wells / Hydraulics / Mathematical models*

(Location: HQ Call No: PER Record No: H 14045)

**Abstract:** A simple method of computing transmissivity and storativity from the analysis of observation-well response during constant-head aquifer tests is presented. The proposed methodology is based on approximate solutions developed using the Boltzmann transformation technique, and is demonstrated to be valid for many practical situations. It is shown that familiar constant-rate solutions (e.g., the Theis equation) can be generalized for the constant-head case if the head change at the observation well is normalized by the flow rate at the test well and then used as the time-dependent variable. A generalized form of the Jacob-Lohman approximation which is valid at every point in the aquifer is presented. Analysis of several hypothetical constant-head test data using the suggested approach indicate that estimates of transmissivity are much more reliable than those of storativity. However, both hydraulic parameters appear to be reasonably estimated if the interwell distance is at least two orders of magnitude larger than the wellbore radius.

14014. Mitchell, J.K.; Engel, B.A.; Srinivasan, E.R.; Wang, S.S.Y. 1993. Validation of AGNPS for small watersheds using an integrated AGNPS/GIS system. Water Resources Bulletin, 29(5):833-842.

*Watersheds / GIS / Sedimentation / Erosion / Runoff / Simulation models / Statistics / Hydrology / Calibrations / USA / Illinois*

(Location: HQ Call No: PER Record No: H 14070)

**Abstract:** The AGNPS (Agricultural NonPoint Source) model was evaluated for predicting runoff and sediment delivery from small watersheds of mild topography. Fifty sediment yield events were monitored from two watersheds and five nested subwatersheds in East Central Illinois throughout the growing season of four years. Half of these events were used to calibrate parameters in the AGNPS model. Average calibrated parameters were used as input for the remaining events to obtain runoff and sediment yield data. These data were used to evaluate the suitability of the AGNPS model for predicting runoff and sediment yield from small, mild-sloped watersheds. An integrated AGNPS/GIS system was used to efficiently create the large number of data input changes necessary to this study. This system is one where the AGNPS model was integrated with the GRASS (Geographic Resources Analysis Support System) GIS (Geographical Information System) to develop a decision support tool to assist with management of runoff and erosion from agricultural watersheds. The integrated system assists with the development of input GIS layers to AGNPS, running the model, and interpretation of the results.

14015. **Mitsuno, T. 1991.** Energy conservation and its effective use in irrigation pipeline system. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.276-287.

*Water distribution / Energy consumption / Irrigation systems / Pipes / Pumps / Japan*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14745)

14016. **Mohamed, B. 1990.** Evaluation de trente hydro-pompes vergnet dans la province du Yatenga (Burkina Faso) [Evaluation of 30 Vergnet waterpumps in Yatenga Province (Burkina Faso)] Bulletin de Liaison du Comite Interfricain d'Etudes Hydrauliques, No.79 January:29-33.

*Pumps / Evaluation / Burkina Faso*  
(Location: ODI Call No: ODI Journals Record No: L 942391)

14017. **Mohammad, F.S.; Al-Amoud, A.I. 1993.** Water conservation through irrigation scheduling under arid climatic conditions. Agricultural Water Management, 24:251-264.

*Irrigation scheduling / Arid zones / Water conservation / Models / Computer software / Soil moisture / Monitoring / Saudi Arabia / Arab countries*  
(Location: HQ Call No: P 3380 Record No: H 14196)

**Abstract:** A field experiment was carried out on wheat crop at the project sites of Hail Development Company (HADCO), about 500 km

north-west of Riyadh, Kingdom of Saudi Arabia. Four centre pivot circles (each 54 ha in area) were used in the study. A model based on the Modified Penman Method (FAO version) was developed and used for irrigation scheduling. The required micro-climatic parameters were continuously monitored by an automatic weather station installed at the site and transmitted to a computer for processing and analyses. The results of the experiment indicated that an appreciable amount of water (25%) was saved as compared to the irrigation practice adopted by HADCO, and the yield is increased significantly by using this technique of scheduling. In addition, the conservation of water results in reducing the working hours of the equipment and labor.

14018. **Mohapatra, P.K.; Bhallamudi, S.M. 1994.** Bed-level variation in channel expansions with movable beds. Journal of Irrigation and Drainage Engineering, 120(6):1114-1121.

*Open channels / Mathematical models / Stream flow*  
(Location: HQ Call No: PER Record No: H 15685)

14019. **Montes, J.S. 1993.** Numerical solution to the inverse weir problem. Water Resources Journal, 178:45-52.

*Weirs / Design / Flow discharge / Hydraulics / Sedimentation / Open channels*  
(Location: HQ Call No: PER Record No: H 14043)

**Abstract:** The inverse weir problem, that of determining the weir shape in a thin plate weir to comply with a given head-discharge equation is known to depend on the solution of integral equation. This has been analytically solved in the past through a reduction to Abel's integral equation, when the discharge law is of the exponential type. Two simple and general numerical solutions to this equation are suggested and their results compared with a number of well known cases from the literature. The numerical method is then applied to the calculation of control weirs for open channels and sedimentation basins.

14020. **Moran, M.S. 1994.** Irrigation management in Arizona using satellites and airplanes. Irrigation Science, 15(1):35-44.

*Irrigation management / Remote sensing / Satellite surveys / Evaluation / Crop production / Monitoring / Irrigation scheduling / Cost benefit analysis / USA / Arizona*  
(Location: HQ Call No: PER Record No: H 15386)

14021. **Mudiare, O.J.; Adamu, J.Y. 1993.** Estimation of design inflow rate in border irrigation using simulated advance and recession curves. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The

Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.755-775.

*Border irrigation / Infiltration / Water distribution / Irrigation efficiency / Simulation / Rice / Nigeria*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15243)

14022. **Murthy, K.K.; Prakash, M.N.S. 1994.** Practical constant-accuracy linear weir. Journal of Irrigation and Drainage Engineering, 120(3):550-562.

*Weirs / Design / Flow discharge / Measurement / Optimization*

(Location: HQ Call No: PER Record No: H 14415)

**Abstract:** This paper is concerned with the modifications of the Extended Bell-mouth Weir (EBM weir) earlier designed by Keshava Murthy. It is shown that by providing inclined sides (equivalent to providing an inward-trapezoidal weir) over a sector of a circle of radius R, separated by a distance 2t, and depth d, the measurable range of EBM can be considerably enhanced (over 375%). Simultaneously, the other parameters of the weir are optimized such that the reference plane of the weir coincides with its crest making it a constant -accuracy linear weir. Discharge through the aforementioned weir is proportional to the depth of flow measured above the crest of the weir for all heads in the range of  $0.5R \leq h \leq 7.9R$ , within a maximum deviation of  $\pm 1\%$  from the theoretical discharge. Experiments with two typical weirs show excellent agreement with the theory by giving a constant-average coefficient of discharge of 0.619.

14023. **Murthy, Y.K. 1981.** The irrigation engineer and the farmer. Journal of Indian Water Resources Society, 1(2):14-20.

*Irrigation engineering / Farming systems*

(Location: ODI Call No: ODI Journals Record No: L 942442)

14024. **Murty, V.V.N. 1990.** Interfacing on-farm water requirements with main system operation in irrigation projects. Paper presented at the Regional Workshop on Improved Irrigation System Performance for Sustainable Agriculture, Bangkok, Thailand, 22-26 October 1990. pp.58-66.

*Irrigation programs / Simulation models / Evapotranspiration / Irrigation scheduling / Rice / Pakistan / Thailand / Indus River*

(Location: HQ Call No: P 3372 Record No: H 14188)

14025. **Mushtaq, H.; Mays, L.W.; Lansey, K.E. 1994.** Optimum operation of recharge basins. Journal of Water Resources Planning and Management, 120(6):927-943.

*Recharge / Mathematical models / Optimization methods / Infiltration / Groundwater / Soil moisture*

(Location: HQ Call No: PER Record No: H 15589)

14026. **Narasimhan, T.N.; Zhu, M. 1994.** Transient flow of water to a well in an unconfined aquifer: Applicability of some conceptual models. Water Resources Journal, March:14-28.

*Aquifers / Models / Wells*

(Location: ODI Record No: L 942940)

14027. **Nat, B.S. 1977.** Conservation of water by lining of watercourses in Haryana State. Chandigarh, India: Haryana State Minor Irrigation (Tubewells) Corporation. 19p.

*Irrigation canals / Canal linings / Water conveyance / Water conservation / Water distribution / Water scarcity / Legislation / Tube wells / India / Haryana*

(Location: HQ Call No: P 3277 Record No: H 13762)

14028. **Neville, D.F.J.; Woudeneh, T. 1993.** Deferred drainage meets flexibility criteria. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.591-602.

*Subsurface drainage / Groundwater / Monitoring / Water table / Ethiopia*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15229)

14029. **NIA; IIMI. Philippines; USAID. 1991.** ISO-IA interface manual on the operation and maintenance of national irrigation systems. Quezon City, Philippines: NIA. ix, 133p.

*Irrigation operation / Maintenance / Irrigation systems / Training / Irrigation management / Philippines*

(Location: HQ Call No: IIMI 631.7.8 G732 NIA Record No: H 14234)

14030. **NIA; IIMI. Philippines; USAID. 1991.** Manual on PIO-IA interface on operation and maintenance of communal irrigation system. Quezon City, Philippines: NIA. vi, 24p. + appendices.

*Communal irrigation systems / Farmer-agency interactions / Planning / Farmers' associations / Training / Philippines*

(Location: HQ Call No: IIMI 631.7.8 G732 NIA Record No: H 14236)

14031. **Nield, S.P.; Townley, L.R.; Barr, A.D. 1994.** A framework for quantitative analysis of surface water-groundwater interaction: Flow geometry in a vertical section. Water Resources Research, 30(8):2461-2475.

*Groundwater / Surface water / Flow / Aquifers / Mathematical models / Sedimentation / Australia / Perth / Swan River*

(Location: HQ Call No: PER Record No: H 15502)

14032. Nieuwenhuyse, P. 1993. Integrated mechanical silt clearance and weed control in the Gezira Scheme, Sudan. In Jurriens, M.; Jain, K.P. (Eds.), Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands. New Delhi, India: ILRI/WALMI. pp.113-130.

*Siltation / Weed control / Aquatic weeds / Irrigation programs / Irrigation canals / Maintenance / Irrigation equipment / Mechanical methods/ Sudan / Gezira Scheme / Nile River*

(Location: HQ Call No: 631.7.1 G635 JUR Record No: H 15138)

14033. Nikolaidis, N.P.; Hu, H.L.; Ecsedy, C.; Lin, J.D. 1993. Hydrologic response of freshwater watersheds to climatic variability: Model development. Water Resources Research, 29(10):3317-3328.

*Watershed management / Hydrology / Mathematical models / Climate / Evapotranspiration / Calibrations / Energy / Case studies / USA / Vermont*

(Location: HQ Call No: PER Record No: H 13685)

**Abstract:** To evaluate the hydrologic and biogeochemical response of freshwater watersheds to climatic variability properly, a mathematical model with detailed parameterization in describing the hydrologic and thermal processes in a watershed is needed. For this purpose, the Enhanced Trickle Down model was modified to predict the hydrologic and thermal responses of freshwater watersheds to various climate change scenarios. Modifications of the model included the incorporation of an energy transfer submodel, an improved hydraulic conductivity scheme, and the coupling with a point source snowmelt model. The results of calibration and verification of the model using 8 years of field data collected at the Agricultural Research Service, W-3 watershed, located near Danville, Vermont, are presented.

14034. Ningsheng, C.; Yizhong Z.; Xiulan, Z.; Dongling, Z.; Lun, Y. 1991. Development of deep ground water in the Heilonggang Region. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. pp.141-153.

*Groundwater development / Groundwater extraction / Aquifers / Mathematical models / Water table / China*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14896)

14035. Odgaard, A.J.; Mosconi, C.E. 1987. Streambank protection by Iowa vanes. ISWRRI report no.146; IIHR report no.306. viii, 34p.

*Flow control / Velocity / Flow channels / Performance evaluation / Design / Rivers / Erosion / USA/ Iowa*

(Location: HQ Call No: P 3552 Record No: H 14804)

14036. Olszta, W. 1993. Simulation of transpiration and leaf temperature for irrigation scheduling. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.101-108.

*Irrigation scheduling / Simulation models / Water deficit / Remote sensing / Evapotranspiration / Poland*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15069)

14037. Onta, P.R.; Mekpruksawong, P.; Loof, R. 1993. Impact of the spatial distribution of rainfall on irrigation water demand. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.885-897.

*Rain / Irrigation water / Water demand / Irrigation efficiency / Water requirements / Thailand*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15253)

14038. Orzol, L.L.; McGrath, T.S. 1993. Summary of modifications of the U.S. geological survey modular, finite-difference, ground-water flow model to read and write geographic information system files. Water Resources Bulletin, 29(5):843-846.

*Groundwater / GIS / Models / USA*

(Location: HQ Call No: PER Record No: H 14071)

**Abstract:** The U.S. Geological Survey modular, three-dimensional, finite-difference, ground-water flow model, commonly called MODFLOW, has been modified so that it can read and write files used by a geographic information system (GIS). The modified model program is called MODFLOWARC. The design of MODFLOWARC parallels the design of the ground-water flow model program MODFLOW. The names of the variables, modules, and submodules used to explain the operations of MODFLOWARC were derived from the names used in MODFLOW. During the data input phase, MODFLOWARC reads array control records similar to the original control records of MODFLOW, except an additional variable is added. This additional variable is the name of the computer files

containing array data in GIS format. Data output is achieved by setting record/input flags and by supplying a variable that is the name of the directory where the output data will be recorded. The modifications to MODFLOW were minimized so that MODFLOWARC will operate on an existing ground-water flow model without modifying array control records.

**14039. Oskam, R.H. 1994.** The relevance of computerized decision support for water management: Analysis of irrigation management performance and the appropriateness of a decision support system for water management in actual irrigation schemes in Sri Lanka. Report of research conducted within IIMI, Headquarters, April-October 1993, as final thesis work for Masters Degree in Management Studies, University of Twente, Netherlands. ix, 83p. + annexes.

*Decision support tools / Computer techniques / Computer models / Water management / Irrigation management / Performance evaluation / Performance indexes / Irrigation programs / Decision making / Models / Policy / Case studies / Financing / Marketing / Personnel management / Sri Lanka / Uda Walawe*  
(Location: HQ Call No: IIMI 631.7.1 G744 OSK Record No: H 15156)

**14040. Oster, J.D.; Smith, R.B.; Phene, C.; Fulton, A.; Styles, S.W.; Fernandes, T. 1993.** Irrigation methods for drainage reduction subsurface drip vs. furrow irrigation. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1083-1095.

*Irrigation operation / Drainage / Drip irrigation / Furrow irrigation / USA*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15340)

**14041. Palaskar, M.S.; Suryavanshi, A.R.; More, S.D.; Varade, S.B. 1991.** Irrigation scheduling in command areas based on soil crop climate conditions. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.230-244.

*Irrigation scheduling / Soil-water-plant relationships / Water delivery / Crops / Diversification / Canal irrigation / India / Maharashtra*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14743)

**14042. Palitha, W.; Gunawardena, E.R.N. 1992.** Development and testing of a soil moisture deficit indicator for irrigation scheduling. Tropical Agricultural Research, 4:327-338.

*Irrigation scheduling / Soil moisture / Evapotranspiration / Lysimetry / Drainage / Simulation / Indicators / Sri Lanka*  
(Location: HQ Call No: P 3628 Record No: H 12639)

**14043. Parkhurst, D.L. 1994.** Ground-water-quality assessment of the Central Oklahoma aquifer, Oklahoma-analysis of available water-quality data through 1987. Chapter B. Washington, DC, USA: US Government Printing Office. pp.B74. (US Geological Survey water-supply paper 2357)

*Groundwater / Aquifers / Water quality / Assessment / USA / Oklahoma*  
(Location: ICID Record No: 26262)

**14044. Persoons, E.; El Gueddari, Faouzi, A.; Crickx, D. 1992.** Telemonitoring system for irrigation in Drâa valley (Morocco) In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 3. Leuven, Belgium: Center for Irrigation Engineering. pp.875-887.

*Water management / Water distribution / Computer techniques / Networks / Monitoring / Telecommunications / Morocco*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14469)

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*Water distribution / Large-scale systems / Optimization methods / Data processing / Models*  
(Location: HQ Call No: PER Record No: H 13773)

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*Groundwater management / Water supply / Water distribution / Optimization methods / Pumping / Simulation models / USA / Tennessee / Memphis*  
(Location: HQ Call No: PER Record No: H 15100)

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*Drip irrigation / Design criteria / Computer models / Simulation*

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*Basin irrigation / Mathematical models / Simulation / Infiltration / Flow*  
(**Location:** HQ **Call No:** PER **Record No:** H 15368)
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*Basin irrigation / Simulation models / Performance / Infiltration / Flow*  
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*Water control / Irrigation engineering / Irrigation design / Water delivery / Irrigation scheduling / Performance / Climate / Crops / Water requirements / Sustainability / Modernization / Case studies / Brazil / Egypt / India / Indonesia / Madagascar / Mexico / Middle East / Iraq / Malaysia / Morocco / Nigeria / Peru / Sudan / Sri Lanka / USA*  
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*Water resources / Water use efficiency / Irrigation programs*  
(**Location:** HQ **Call No:** P 3505 **Record No:** H 14658)
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*Furrow irrigation / Performance evaluation / Simulation / Mathematical models / Percolation / Runoff / Calibrations / Soils / Water distribution*  
(**Location:** HQ **Call No:** 631.7.1 G000 FEY **Record No:** H 14437)
14053. **Powers, A.R. 1993.** AgriMet - a real-time data collection system for agricultural consumptive use modeling. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: *Water management in the next century: Transactions: Vol.1-G, Symposium. R.3.* New Delhi, India: ICID. pp.31-41.  
*Data collection / Networks / Models / Computer techniques / Remote sensing / Hydrology / Climate / Forecasting / Monitoring / Water requirements / Crop production / Evapotranspiration / Irrigated farming / Irrigation scheduling / USA*  
(**Location:** HQ **Call No:** ICID 631.7 G000 ICI **Record No:** H 15730)
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*River basin development / Water resources / India*  
(**Location:** HQ **Call No:** P 3287 **Record No:** H 13840)
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*Groundwater / Surface water / Conjunctive use / Mathematical models / Salinity control / Crop yield / Leaching*  
(**Location:** HQ **Call No:** PER **Record No:** H 14670)
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*Groundwater / Irrigation water / Conjunctive use / Mathematical models / Salinity control / Australia*  
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*Irrigation programs / Waste waters / Water distribution / Water conveyance / Water transfer / Israel*  
(**Location:** HQ **Call No:** PER **Record No:** H 15394)
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*Subsurface drainage / Pumping / Case studies / Mathematical models / Linear programming / Recharge / Groundwater / Salinity / Waterlogging / Simulation models / Australia / Wakool Irrigation District*  
(**Location:** HQ **Call No:** PER **Record No:** H 15482)



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*Computer models / Irrigation engineering / Economic analysis / Costs / Performance*  
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*Drainage / Rice / Crop-based irrigation / Irrigation programs / Irrigation management / Water measurement / Groundwater / Irrigation scheduling / Farming systems / Indonesia / West Java*  
(Location: HQ Call No: IIMI 631.7.1 G673 PUS Record No: H 15161)  
*Abstract:* DAE/GMU-IIMI Collaborative Research Program (No.937-INO-IIMI-ADB), Gadjah Mada University, Bulaksumur, Yogyakarta, Indonesia.
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*Drip irrigation / Arid zones / Irrigation programs / China*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14908)
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*Irrigation engineering / Irrigated farming / Pipes / Irrigation water / Irrigation systems / Water conservation / Soil water / Rice / Wheat / China*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14905)
14063. **Radulovich, R.A. 1990.** AQUA, a model to evaluate water deficits and excesses in tropical cropping. Part II - Regional yield prediction. Agricultural and Forest Meteorology, 52:253-261.  
*Water deficit / Water balance / Crop yield / Rice / Beans (phaseolus) / Maize / Water requirements / Water stress / Models*  
(Location: HQ Call No: P 3533 Record No: H 14758)
14064. **Rahimi, H.; Bazaz, M. 1993.** Lining of irrigation canals by chemically treated soils. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1191-1202.  
*Canal linings / Canal construction / Irrigation canals / Seepage loss / Soils / Water quality / Erosion / Iran*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15349)
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*Water table / Aquifers / Groundwater / Forecasting / Recharge*  
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14066. **Rajagopalan, M.; Demaine, H. 1994.** Issues in energy subsidies for irrigation pumping: A case study from Mahbubnagar District, Andhra Pradesh, India. Energy Policy, January:89-95.  
*Energy / Pumping / Costs / Irrigation operation / India / Andhra Pradesh*  
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*Irrigation equipment / Water lifting / Water wheels / Manual pumps / Irrigated farming / Arid zones / China / Sri Lanka / Anamaduwa*  
(Location: HQ Call No: P 3621 Record No: H 11405)
14068. **Rajapakse, C.L.; Basnayake, B.F.A. 1992.** Identification of a manually operated water lifting device for small scale cash crop growers in the dry zone. Tropical Agricultural Research, 4:315-326.  
*Irrigation equipment / Water lifting / Manual pumps / Irrigated farming / Small farms / Arid zones / Sri Lanka*  
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14069. **Rana, M.Y. 1994.** A simple rainfall runoff model for forecasting daily discharge. Journal of Irrigation Engineering and Rural Planning, 27:39-48.  
*Rainfall-runoff relationships / Mathematical models / Forecasting / Watersheds / Catchment areas / Calibrations / Bangladesh*  
(Location: HQ Call No: PER Record No: H 15515)
14070. **Rao, A.R.; Subrahmanyam, V.; Thayumanavan, S.; Namboodiripad, D. 1994.** Seepage effects on sand-bed channels. Journal of Irrigation and Drainage Engineering, 120(1):60-79.  
*Open channels / Seepage / Design / Experiments*

(Location: HQ Call No: PER Record No: H 13878)

**Abstract:** Experiments were conducted to find the effects of seepage on flow over a sand bed in a straight rectangular flume under two conditions: (1) When the channel bed is plane, horizontal, and nontransporting; and (2) when the bed is transporting at a constant sediment concentration. Effects of both injection and suction, caused by seepage flow into and out of the channel bed, are studied for condition 1: and only suction effects are studied for condition 2. Three sands, of sizes 0.34 mm, 0.53 mm, and 0.80 mm, are used in the study. It is found that seepage can cause an increase or decrease in the bed shear stress relative to no seepage for the two conditions. The change in bed shear stress depends on the relative magnitudes of the bed shear stress and the critical shear stress of particles under the no-seepage condition, sediment concentration, and the seepage rate. Quantitative relationships giving the ratio of bed shear stress with and without seepage are presented for both conditions of the bed. A procedure to estimate the changes in bed shear stress, friction factor, Manning's n, and stream power due to seepage for known initial conditions of the channel and the amount of applied seepage is presented.

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*Groundwater / Analytical methods / Mathematical models*

(Location: HQ Call No: 631.7.1 G000 RAU Record No: H 14031)

14072. **Ravelli, F.; Rota, P. 1991.** Irrigation scheduling with "RR-2.0" computerized programme. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.200-209.

*Irrigation scheduling / Computer techniques / Water requirements / Irrigation efficiency / Soil water relations / Leaching*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14740)

14073. **Reddy, J.M. 1992.** Decentralized constant-volume control of irrigation canals. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.3. Leuven, Belgium: Center for Irrigation Engineering. pp.889-898.

*Irrigation canals / Open channels / Mathematical models / Design / Control methods / Simulation models*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14470)

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*Irrigation canals / Irrigation operation / Control methods / Mathematical models / Water delivery / Simulation*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14733)

14075. **Reddy, J.M.; Singh, V.P. 1994.** Modeling and error analysis of kinematic-wave equations of furrow irrigation. *Irrigation Science*, 15(2/3):113-122.

*Furrow irrigation / Flow / Models*

(Location: HQ Call No: PER Record No: H 15692)

14076. **Reddy, J.M. 1994.** Optimization of furrow irrigation system design parameters considering drainage and runoff water quality constraints. *Irrigation Science*, 15(2/3):123-136.

*Furrow irrigation / Irrigation design / Optimization / Runoff / Drainage / Water quality / Water costs / Economic aspects / Mathematical models*

(Location: HQ Call No: PER Record No: H 15693)

14077. **Reddy, J.M.; Martinez, V. 1992.** Optimization of furrow irrigation systems design considering drainage and runoff water quality. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.3. Leuven, Belgium: Center for Irrigation Engineering. pp.923-941.

*Furrow irrigation / Design / Drainage / Runoff water / Water quality / Optimization methods / Mathematical models / Costs*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14473)

14078. **Remington, T.; Posner, J. 1994.** The impact of run-off retention dikes on the rice-based cropping systems in the small valleys of Western Gambia. *Bulletin du Réseau Irrigation Afrique de l'Ouest*, No.4:15-18.

*Runoff / Rice / Cropping systems / Groundwater / Hydrology / Crop production / Gambia*

(Location: HQ Call No: PER Record No: H 14577)

14079. **Renault, D.; Wallender, W.W. 1994.** Furrow advance-rate solution for stochastic infiltration properties. *Journal of Irrigation and Drainage Engineering*, 120(3):617-633.

*Furrow irrigation / Infiltration / Surface irrigation*  
(Location: HQ Call No: PER Record No: H 14420)

**Abstract:** A flow-balance equation of surface irrigation is used to solve, section by section, the advance problem on heterogeneous soils. The advance-linear-velocity (ALIVE) solution as a function of time is a sum of exponential terms. Within a section, the properties are uniform, and two linear relationships between the advance rate  $x'(t)$  and the distance  $x(t)$  result. The inverse problem is solved step by step, identifying the Horton infiltration law of the studied section from the record of the velocity and the knowledge of the infiltration in the previous sections. Theoretical examples and field experiments are compared. When applying a standard evaluation approach, assuming a uniform infiltration function to an heterogeneous soil misleading results can occur. Perturbations in the advance rate can lead to an incorrect infiltration function when using either the standard ALIVE or Kostiaikov-based hydrologic models. However, a nonstandard ALIVE procedure is feasible since the distinction between the sections having different infiltration properties can be detected. To apply the velocity analysis, a high density of advance points is required.

14080. **Rey, J.; Hemakumara, H.M. 1994.** Decision support system (DSS) for water distribution management: Theory and practice. Colombo, Sri Lanka: IIMI. vii, 44p. (Working paper no.31)

*Decision support tools / Irrigation canals / Water delivery / Water management / Information / Computer techniques / Decision making / Case studies / Sri Lanka / Kirindi Oya*

(Location: HQ Call No: IIMI 631.7.1 G744 REY Record No: H 15117)

14081. **Rey, J.; Kuper, M.; Hemakumara, M. 1994.** Setting up an information system at the main canal level: Participatory approach in Sri Lanka and Pakistan. In IIMI. Pakistan, Tenth progress report on managing irrigation systems to minimize waterlogging and salinity problems. Lahore, Pakistan: IIMI. pp.37.

*Irrigation canals / Information systems / Computer techniques / Participatory management / Decision support tools / Water management / Irrigation canals / Irrigation management / Sri Lanka / Pakistan / Kirindi Oya*

(Location: HQ Call No: IIMI 631.7.5 G730 IIM Record No: H 14222)

14082. **Rijo, M.; Almeida, A.B. 1993.** Performance of an automatic upstream controlled irrigation system: Convey-

ance efficiencies. *Irrigation and Drainage Systems*, 7(3):161-172.

*Water conveyance / Flow measurement / Flow control / Water delivery performance / Irrigation management / Portugal*

(Location: HQ Call No: PER Record No: H 13081)

**Abstract:** This paper presents a study of conveyance efficiencies in the Sorraia Irrigation Project, Portugal. The Irrigation Project is briefly described and flow measurement techniques are analyzed. Results show that efficiencies are higher during week days and normal labor hours and lower during weekends and at night. Water losses are higher than in other similar systems and the main reason is the substitution of the flow rotation method by restricted arranged schedules. An improvement process for saving water and accommodating deliveries to demands is also briefly presented.

14083. **Rivière, N. 1994.** Introduction of a management information system at the main-canal level: A study in the Christian Sub-Division, Fordwah/Eastern Sadiqia Area, Punjab, Pakistan. In IIMI. Pakistan, Tenth progress report on managing irrigation systems to minimize waterlogging and salinity problems. Lahore, Pakistan: IIMI. pp.36.

*Irrigation management / Management Information Systems / Computer techniques / Water distribution / Water management / Irrigation canals / Pakistan*

(Location: HQ Call No: IIMI 631.7.5 G730 IIM Record No: H 14221)

14084. **Rizvi, S.A.H. 1994.** Calibration and application of SWATRE for local conditions. Lahore, Pakistan: IWASRI. xii, 88p. (Publication no.135 / NRAP report no.58)

*Calibrations / Soil water / Simulation models / Lysimetry / Flow measurement / Pakistan*

(Location: HQ Call No: 631.7.1 G730 RIZ Record No: H 15324)

14085. **Roaza, H.; Roaza, R.M.; Wagner, J.R. 1993.** Integrating geographic information systems in ground-water applications using numerical modeling techniques. *Water Resources Bulletin*, 29(6):981-988.

*GIS / Groundwater / Simulation models / Aquifers / Calibrations / USA / Florida / Escambia County*

(Location: HQ Call No: PER Record No: H 14511)

14086. **Robinson, D.I.; McGhee, T.J. 1993.** Computer modeling of side-flow weirs. *Journal of Irrigation and Drainage Engineering*, 119(6):989-1005.

*Weirs / Computer models / Open channels*

(Location: HQ Call No: PER Record No: H 13673)

**Abstract:** A new computational procedure is presented that addresses the complex phenomena

found in declining-flow regimes and does not require that the boundary conditions of the declining-flow segment be defined. These conditions are determined as part of the solution of the larger problem of determining the flows in the entire conveyance system. The procedure utilizes the principle of conservation of momentum in the declining-flow segment, coupled with standard water-profile procedures in the constant-flow segments. The algorithm determines whether the flow is supercritical, subcritical or a combination of both. If a hydraulic jump occurs, its location is found, even if it lies within the declining-flow segment. The procedure is applied specifically to the side-flow weir, and theoretical computations are compared to experimental values that have been published by others. Excellent correspondence exists between the theoretical and experimental results. Examples of the results for a variety of conditions are presented, including the circumstance in which a hydraulic jump occurs in the weir reach.

14087. **Roest, C.W.J.; Gawad, S.T.A.; Khalek, M.A.A. 1993.** Water management in the Eastern Nile Delta of Egypt, validation of the SIWARE model. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1263-1283.

*Water management / River basins / Simulation models / Large-scale systems / Water reuse / Drainage / Arid lands / Irrigated farming / Decision making / Evapotranspiration / Groundwater / Salinity / Calibrations / Egypt / Nile River*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15353)

14088. **Rogers, M.E.; Noble, C.L.; Nicolas, M.E.; Hal-loran, G.M. 1994.** Leaf, stolon and root growth of white clover (*Trifolium repens* L.) in response to irrigation with saline water. *Irrigation Science*, 15(4):183-194.

*Irrigation effects / Salinity / Plant growth / Australia / Victoria / Tatura*

(Location: HQ Call No: PER Record No: H 15699)

14089. **Roguski, W.; Labedzki, L. 1991.** Estimating grassland water deficits for planning and designing irrigation. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. pp.211-219.

*Simulation models / Water deficit / Water requirements / Soil moisture / Crop growth / Evapotranspiration / Irrigation programs / Poland*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14903)

14090. **Rohana, K.W.N. 1994.** System operation model. In Haq, K.A.; Rey, J.; Sakthivadivel, R.; Samarasekera, B. M.S. (Eds.), Use of computer-operated models as decision-support tools in operation and management of irrigation systems: Sri Lankan experience - Proceedings of the Workshop on the Use of Computer-Operated Models as Decision-Support Tools in Operation and Management of Irrigation Systems held in Galgamuwa, Sri Lanka from 15 to 16 July 1993. Colombo, Sri Lanka: IIMI. pp.15-16.

*Computer models / Computer software / Decision support tools / Irrigation operation / Irrigation management / Monitoring / Management Information Systems / Calibrations / Sri Lanka / Polonnaruwa*

(Location: HQ Call No: IIMI 631.7.1 G744 HAQ Record No: H 15123)

14091. **Ryan, T.P.; Sieh, D. 1993.** Integrating hydrologic models, geographic information systems, and multiple databases: A data centered approach. Proceedings of the Federal Interagency Workshop on Hydrologic Modeling Demands for the 90's. US Geological Survey Water-Resources Investigations Report 93-4018, 1993. pp.3-26 - 3-34.

*Water resource management / Hydrology / Simulation models / GIS / Computer software / Databases / River basin development / Case studies / Soil conservation / USA / Colorado River*  
(Location: HQ Call No: P 3648 Record No: H 15539)

14092. **Saixing, Z.; Shousheng, L.; Qinghua, L. 1993.** A large system optimum model for irrigation planning. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.743-753.

*Irrigation management / Management planning / Computer models / Linear programming / Irrigation scheduling / Water allocation / Groundwater / Surface water / Conjunctive use / Soil water / Large-scale systems / China / Mongolia*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15242)

14093. **Sakkas, J.G.; Bellos, C.V.; Klonaraki, M.N. 1994.** Numerical computation of surface irrigation. *Irrigation Science*, 15(2/3):83-99.

*Surface irrigation / Mathematical models / Simulation / Open channels / Flow / Infiltration*  
(Location: HQ Call No: PER Record No: H 15690)

14094. **Saleem, M. 1994.** Using cavity well to determine aquifer thickness and constants. *Journal of Irrigation and Drainage Engineering*, 120(3):504-519.

*Aquifers / Tube wells / Groundwater / Measurement / Water lifting / Mathematical models / Hydraulics*

(Location: HQ Call No: PER Record No: H 14412)

**Abstract:** A simple mathematical approach is presented for using a cavity well to determine aquifer constants like hydraulic conductivity K and specific storage coefficient Ss. The aquifer may be either excessively thick or thin. Mathematical formulas are also available to determine both the radius  $r_c$  of the artificially developed cavity below the upper impermeable layer of the confined aquifer and the thickness  $H_0$  of the aquifer when it is thin. Mathematical analysis shows that a cavity well, once developed, is an excellent and efficient tool for lifting groundwater at a low energy level. It is further proved that without the installation of observation well(s) (depending upon the type of the aquifer, whether excessively thick or thin), the data, collected from within the pumped well, fails to provide information about the aquifer constants, cavity radius, or aquifer thickness.

14095. **Sanders, D.C. 1993.** Design considerations for drip irrigation. *Far Eastern Agriculture*, July/August:24, 26.

*Drip irrigation / Irrigation design / Vegetables*

(Location: HQ Call No: P 3257 Record No: H 13735)

14096. **Sarkar, T.K.; Prasad, R.K. 1994.** Improved operation and maintenance of lifting irrigation systems. In *FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation*, Bangkok, Thailand, 27 September – 1 October 1993. Bangkok, Thailand: FAO. pp.128–143.

*Water lifting / Irrigation operation / Maintenance / Costs / Tube wells / Case studies / Cooperatives / Water distribution / Government managed irrigation systems / India*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14869)

14097. **Schepers, J.D.; van de Kreeke, P.W.; Heynert, K.V. 1993.** Future water management of Northwest Groningen (The Netherlands) In *ICID, 15th International Congress on Irrigation and Drainage*, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36–R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.909–922.

*Water management / Planning / Water resources / Computer models / GIS / Netherlands / Groningen*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15255)

14098. **Schmittner, K.E.; Giresse, P. 1994.** Mathematical-statistical simulation of topsoil particle losses during

heavy rainfall. *Agricultural Water Management*, 25(2):121–134.

*Simulation models / Mathematical models / Erosion / Runoff / Rain / Soils / Spain / France*

(Location: HQ Call No: PER Record No: H 14267)

14099. **Schneider, A.D.; New, L.L. 1986.** Engine efficiencies in irrigation pumping from wells. In *American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water*, Vol.29. St. Joseph, MI, USA: ASAE. pp.1043–1046.

*Irrigation equipment / Pumping / Wells / USA / Texas*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13854)

14100. **Schuermans, J.; Schuermans, W.; van Leeuwen, J. 1992.** Improved real time control of water deliveries. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management*, Leuven, Belgium, 14–17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.485–494.

*Water delivery / Regulated flow / Downstream control / Simulation / Computer techniques / Irrigation canals / USA / California*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14429)

14101. **Schuermans, W.; van der Krogt, W.N.M. 1992.** Decision support system for irrigation networks. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management*, Leuven, Belgium, 14–17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.727–736.

*Decision support tools / Irrigation management / Water management / Irrigation systems / Irrigated farming / Monitoring / Performance evaluation / Management training / Simulation models / Computer techniques / GIS / Performance indexes / Indonesia / Egypt / Cidurian Irrigation Scheme / Fayoum*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14453)

14102. **Sen, Z.; Sabtan, A.A. 1993.** Straight-line intercept method in aquifer volume calculations. *Water Resources Journal*, 178:70–74.

*Groundwater potential / Reservoirs / Aquifers / Models*

(Location: HQ Call No: PER Record No: H 14046)

**Abstract:** Volume calculations in various aspects of groundwater resources evaluation play a significant role. However, these calculations are made by different classical techniques, each of which employs the finite element concept. A common requirement in these techniques is the adaptation of a basic height-like contour interval. The accuracy of the estimated volume is influenced by the subjectivity on the part of the person doing the contouring on a specified contour interval. It is observed that there is a linear relationship between the contour interval and the estimated volume. The basic idea of this paper is to use a simple drawing procedure of a few points of different contour intervals versus the resulting volumes. A regression line is fitted through the scatter of these points. The best volume estimate corresponds to zero contour interval, i.e., the intercept of the straight line with the volume axis. This technique provides a common basis in that different researchers arrive at exactly the same conclusion for a given data set. The proposed method is verified by calculating the reservoir volume of a laboratory dam model with the known reservoir volume. It was found that the estimated volume was off by only 5 per cent of the measured one. Further applications of the method are given for some observed data from the Floridan aquifer and a Black Hills dam reservoir.

14103. **Shadid, S.A.; Jenkins, D.A. 1992.** Utilization of simulation system for quick screening of soils against salinity and sodicity. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.2.* Leuven, Belgium: Center for Irrigation Engineering. pp.615-626.

*Simulation models / Salinity / Irrigation water / Leaching / Water quality / Soil management / Soil water / Pakistan*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14442)

14104. **Shahid, B.A.; Kuper, M.; Vander Velde, E.J. 1994.** Improving canal system management: An intervention to calibrate control structures in Punjab, Pakistan. In IIMI. Pakistan, Tenth progress report on managing irrigation systems to minimize waterlogging and salinity problems. Lahore, Pakistan: IIMI. pp.38.

*Irrigation canals / Distributary canals / Control methods / Calibrations / Water measurement / Water delivery performance / Irrigation management / Pakistan*

(Location: HQ Call No: IIMI 631.7.5 G730 IIM Record No: H 14223)

14105. **Shanholtz, V.O.; Younos, T.M. 1994.** A soil water balance model for no-tillage and conventional till systems. *Agricultural Water Management*, 26(3):155-168.

*Soil-water-plant relationships / Tillage / Soil moisture / Plant growth / Surface runoff / Evaporation / Evapotranspiration / Calibrations / Simulation models / Computer software*

(Location: HQ Call No: PER Record No: H 15664)

14106. **Shaozhong, K.; Minggang, Z. 1992.** Ways for the rational utilization of agriculture water resources in the Loess Plateau. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.2.* Leuven, Belgium: Center for Irrigation Engineering. pp.809-813.

*Water resources / Water use efficiency / Irrigation water / Water deficit / Crop production / Rain / Mathematical models / China / Mongolia / Loess Plateau*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14462)

14107. **Sharratt, B.S. 1994.** Observations and modeling of interactions between barley yield and evapotranspiration in the subarctic. *Agricultural Water Management*, 25(2):109-119.

*Water stress / Water use / Models / Water requirements / Crop yield / Evapotranspiration / USA / Alaska*

(Location: HQ Call No: PER Record No: H 14266)

14108. **Shih, J.S.; ReVelle, C. 1994.** Water-supply operations during drought: Continuous hedging rule. *Journal of Water Resources Planning and Management*, 120(5):613-629.

*Water supply / Drought / Water shortage / Simulation models / Mathematical models / Reservoirs / Optimization*

(Location: HQ Call No: PER Record No: H 15102)

14109. **Shrestha, R.B.; Gopalakrishnan, C. 1993.** Adoption and diffusion of drip irrigation technology: An econometric analysis. *Economic Development and Cultural Change*, 41(2):407-418.

*Drip irrigation / Economic aspects / Mathematical models*

(Location: HQ Call No: P 3003 Record No: H 13730)

14110. **Shu, Y.P.; Yu, G.Z.; Wen, Z.Z. 1991.** An engineering model features "drain, store, and use of water in one" in Three River Plain. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. pp.124-131.

*Irrigation engineering / Models / Water conservation / Reservoir storage / Drainage / China*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14895)

14111. **Shyam, R.; Chauhan, H.S.; Sharma, J.S. 1994.** Optimal operation scheduling model for a canal system. Agricultural Water Management, 26(3):213-225.

*Irrigation canals / Water allocation / Irrigation scheduling / Conjunctive use / Linear programming / Models / Income*

(Location: HQ Call No: PER Record No: H 15668)

14112. **Silberstein, I. 1993.** The quality of the irrigation equipment as an important factor in irrigation planning and design. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.467-482.

*Irrigation equipment / Standards / Irrigation systems / Quality control / Performance evaluation*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15221)

14113. **Singh, A.P.K.; Feyen, J.; Persoons, E. 1992.** Evaluation of hybrid model for simulating water flows in closed end sloping borders for design and management. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in co-operation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 1. Leuven, Belgium: Center for Irrigation Engineering. pp.377-393.

*Border irrigation / Simulation / Mathematical models / Flow discharge / Irrigation design*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14367)

**Abstract:** The hybrid model has been evaluated in terms of sensitivity to its parameters as well as prediction accuracy for advance and recession patterns. The sensitivity analysis results have revealed that the model solution parameters are insensitive, whereas the soil and crop parameters are sensitive. The advance and recession patterns are simulated satisfactorily by the model. The model has potential for use in the design and management of dyked and sloping borders.

14114. **Singh, K. 1994.** Managing common pool irrigation tanks: A case study. In Singh, K., Managing common pool resources: Principles and case studies. Delhi, India: OUP. pp.203-226.

*Tank irrigation / Reservoirs / Farmer participation / Water users / Case studies / Crops / Decision making / Villages / India*

(Location: HQ Call No: 333.7 G 635 SIN Record No: H 14388)

14115. **Singh, R.; Satyanarayana, T. 1994.** Automated field irrigation system using side weirs. Journal of Irrigation and Drainage Engineering, 120(1):48-59.

*Weirs / Design / Flow channels / Flow discharge / Irrigation systems / Field tests / Computer techniques*

(Location: HQ Call No: PER Record No: H 13877)

**Abstract:** An automated side weir irrigation system is designed using the concept of constant specific energy. The characteristics of the spatially varied flow along a main channel with multiple side weir outlets are analyzed to determine the roughness coefficient of the channel pertinent to spatially varied flow. A computer program is developed to obtain the geometric parameters of the uniformly discharging weir outlets in a side weir irrigation system. The discharge in the main channel, desired discharges over the weir outlets and the hydraulic and geometric characteristics of the main channel are the main inputs to the computer program. The experiments conducted to evaluate the performance of the developed system show that the deviations of observed discharges from desired ones over the side weir outlets are within 5% for majority of the test runs and in no case these are greater than 10%.

14116. **Singh, R.; Manivannan, D.; Satyanarayana, T. 1994.** Discharge coefficient of rectangular side weirs. Journal of Irrigation and Drainage Engineering, 120(4):814-819.

*Weirs / Flow discharge / Open channels*

(Location: HQ Call No: PER Record No: H 14966)

14117. **Singh, V.P.; Joseph, E.S. 1994.** Kinematic-wave model for soil-moisture movement with plant-root extraction. Irrigation Science, 14(4):189-198.

*Soil moisture / Mathematical models / Soil water relations*

(Location: HQ Call No: PER Record No: H 14672)

14118. **Sivapalasundaram, K. 1994.** Application of a computer model for the Kantale Scheme. In Haq, K. A.; Rey, J.; Sakthivadivel, R.; Samarasekera, B.M.S. (Eds.), Use of computer-operated models as decision-support tools in operation and management of irrigation systems: Sri Lankan experience - Proceedings of the Workshop on

the Use of Computer-Operated Models as Decision-Support Tools in Operation and Management of Irrigation Systems held in Galgamuwa, Sri Lanka from 15 to 16 July 1993. Colombo, Sri Lanka: IIMI. pp.23.

*Computer models / Computer techniques / Irrigation scheduling / Sri Lanka / Kantale*

(Location: HQ Call No: IIMI 631.7.1 G744 HAQ Record No: H 15127)

14119. Skutsch, J. 1993. Development and introduction of MIDAS program for design of small irrigation schemes. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.525-536.

*Computer techniques / Computer software / Irrigation design / Small scale systems / Irrigation programs / Zimbabwe / Kenya*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15225)

14120. Smith, R.E.; Corradini, C.; Melone, F. 1994. Modelling infiltration for multi-storm runoff events. Water Resources Journal, March:28-40.

*Models / Rain / Runoff / Soil management*  
(Location: ODI Record No: L 942941)

14121. Solomon, K.H.; Zoldoske, D.F. 1993. Establishing irrigation equipment testing in Zimbabwe. In Cartwright, A. (Ed.), World agriculture 1994. London, UK: Sterling Publications. pp.96-98.

*Irrigation equipment / Zimbabwe*

(Location: HQ Call No: 630 G000 CAR Record No: H 14119)

14122. Sonou, M. 1994. An overview of lowlift irrigation in West Africa: Trends and prospects. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.61-80.

*Water lifting / Irrigation practices / Low lift irrigation / Pumps / Groundwater irrigation / West Africa*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14862)

14123. Sourell, H. 1991. Development and use of a water and energy saving irrigation system - Mobile drip irrigation. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.288-294.

*Drip irrigation / Irrigation equipment / Irrigation systems / Energy consumption / Costs / Germany / Israel*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14746)

14124. Sperling, C.E. 1993. Small-scale dredging and desilting equipment for canal maintenance. In Jurriens, M.; Jain, K.P.(Eds.), Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands. New Delhi, India: ILRI/WALMI. pp.71-81.

*Irrigation canals / Maintenance / Mechanical methods / Irrigation equipment / Siltation / Costs / Netherlands*

(Location: HQ Call No: 631.7.1 G635 JUR Record No: H 15135)

14125. Spitz, P.; Korsun, S.; Kabes, S.; Lysy, M. 1993. Rationalization of planning and design of sprinkler irrigation. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.501-509.

*Sprinkler irrigation / Irrigation design / Mathematical models / Optimization / Irrigation equipment / Water quality / Czechoslovakia*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15223)

14126. Sposito, G. 1994. Steady groundwater flow as a dynamical system. Water Resources Research, 30(8):2395-2401.

*Groundwater / Flow / Mathematical models / Hydrology / Aquifers*

(Location: HQ Call No: PER Record No: H 15499)

14127. Stamhuis, E. 1993. Channel closures in rivers and estuaries: The development of this technique in The Netherlands. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-I: History special session. R.4. New Delhi, India: ICID. pp.61-87.

*Dams / Construction / Design / Estuaries / Rivers / History / Netherlands*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15740)

14128. Stanghellini, C.; De Lorenzi, F. 1994. A comparison of soil- and canopy temperature-based methods for the early detection of water stress in a simulated patch of pasture. Irrigation Science, 14(3):141-146.

*Water stress / Simulation / Evapotranspiration*

(Location: HQ Call No: PER Record No: H 13988)

14129. Stegman, E.C.; Soderlund, M. 1992. Irrigation scheduling of spring wheat using infrared thermometry. Transactions of the ASAE, 35(1):143-152.

*Irrigation scheduling / Wheat / Crop yield / Water management / Water stress*

(Location: HQ Call No: P 3333 Record No: H 14015)



14130. **Steiner, R.A.; Walter, M.F. 1993.** The effect of allocation schedules on the performance of irrigation systems with different levels of spatial diversity and temporal variability. *Agricultural Water Management*, 23:213-224.  
*Irrigation management / Land management / Computer models / Simulation / Irrigation systems / Performance / Water distribution / Irrigation scheduling*  
(Location: HQ Call No: P 3647 Record No: H 15538)
14131. **Steven, R.; Clary, W.P.; Thornton, C.I. 1994.** Sediment deposition and entrapment in vegetated streambeds. *Journal of Irrigation and Drainage Engineering*, 120(6):1098-1111.  
*Sedimentation / Open channels / Simulation / Stream flow*  
(Location: HQ Call No: PER Record No: H 15684)
14132. **Stevens, R.M.; Douglas, T. 1994.** Distribution of grapevine roots and salt under drip and full-ground cover microjet irrigation systems. *Irrigation Science*, 15(4):147-152.  
*Small scale systems / Drip irrigation / Soil moisture / Salinity / Horticulture*  
(Location: HQ Call No: PER Record No: H 15694)
14133. **Storsbergen, C. 1993.** La planification et la conception des reseaux d'irrigation et de drainage. [Planning and design of irrigation and drainage systems] In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-H: Q.44 - General report(F). New Delhi, India: ICID. pp.69-142.  
*Irrigation design / Irrigation systems / Drainage / Health*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15735)
14134. **Storsbergen, C. 1993.** Planning and design of irrigation and drainage systems. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-H: Q.44 - General report(E). New Delhi, India: ICID. pp.1-67.  
*Irrigation design / Irrigation systems / Drainage / Health*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15734)
14135. **Strelkoff, T.S.; Clemmens, A.J. 1994.** Dimensional analysis in surface irrigation. *Irrigation Science*, 15(2/3):57-82.  
*Surface irrigation / Analysis / Irrigation design / Border irrigation / Simulation / Basin irrigation*  
(Location: HQ Call No: PER Record No: H 15689)
14136. **Sukirno. 1990.** Water distribution equity of tertiary block in rice-based cropping system. Paper presented at Indonesia Workshop on Irrigation Management for Rice-based Cropping System, Gadjah Mada University, Yogyakarta, Indonesia, 13-14 June 1990. 18p.  
*Water distribution / Water allocation / Equity / Irrigation water / Rice / Cropping systems / Soil moisture / Performance evaluation / Groundwater / Water table / Irrigation requirements / Indonesia*  
(Location: HQ Call No: P 3554 Record No: H 14826)
14137. **Suryadi, F.X. 1993.** Methodology for integrated tidal lowland water management strategy in Indonesia. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.838-854.  
*Water management / Strategy planning / Land development / Soil classification / Development projects / Models / Case studies / Drainage / Irrigation / Indonesia*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15250)
14138. **Suzuki, M. 1994.** Outline of the new design criteria for paddy field irrigation in Japan. *Journal of Irrigation Engineering and Rural Planning*, 26:1-4.  
*Design criteria / Paddy fields / Rice / Water use / Water requirements / Crop-based irrigation / Japan*  
(Location: HQ Call No: PER Record No: H 14378)
14139. **Svendsen, M.; Sinha, B. 1994.** A century of perspective on canal irrigation and groundwater development in the Sone Command. Paper prepared for IFPRI/ICAR Workshop on Agricultural Growth in India, New Delhi, India, 1-6 May 1994. 27p.  
*Irrigation canals / Groundwater development / Farmer participation / Sustainability / History / India*  
(Location: HQ Call No: IIMI 631.7.1 G635 SVE Record No: H 14373)
14140. **Swain, R.E.; Weghorst, K.M. 1993.** Application of rainfall-runoff modeling in predicting drainage requirements. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1055-1070.  
*Rainfall-runoff relationships / Simulation models / Watersheds / Drainage / USA*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15338)

14141. **Swamee, P.K.; Pathak, S.K.; Ali, M.S. 1993.** Analysis of rectangular side sluice gate. *Journal of Irrigation and Drainage Engineering*, 119(6):1026-1035.

*Gates / Flow regulators / Flow discharge / Mathematical models*

(Location: HQ Call No: PER Record No: H 13676)

**Abstract:** A side sluice gate is a flow-regulation device widely used in irrigation works for diverting the flow from a main channel to a secondary channel. The discharge of a side sluice gate may be obtained through the concept of an elementary discharge coefficient for an elementary strip along the gate length. Similar to the case of a normal sluice gate, the elementary discharge coefficient for a side sluice gate has been found to be a function of channel flow depth to the gate opening ratio for free-flow conditions. It depends on an additional parameter, namely, the ratio of the crest width to the gate opening for submerged-flow conditions. For a broad-crested side sluice gate, the discharge coefficient involves still one more parameter: the ratio of the crest width to the gate opening.

14142. **Swamee, P.K.; Basak, B.C. 1994.** Design of open-channel-contraction transitions. *Journal of Irrigation and Drainage Engineering*, 120(3):660-668.

*Open channels / Design / Hydraulics*

(Location: HQ Call No: PER Record No: H 14421)

14143. **Swamee, P.K. 1994.** Normal-depth equations for irrigation canals. *Journal of Irrigation and Drainage Engineering*, 120(5):942-948.

*Irrigation canals / Design / Open channels / Irrigation engineering*

(Location: HQ Call No: PER Record No: H 15373)

14144. **Swamee, P.K.; Pathak, S.K.; Ali, M.S. 1994.** Side-weir analysis using elementary discharge coefficient. *Journal of Irrigation and Drainage Engineering*, 120(4):742-755.

*Weirs / Water distribution / Flow discharge*

(Location: HQ Call No: PER Record No: H 14964)

14145. **Taghavi, S.A.; Howitt, R.E.; Marino, M.A. 1994.** Optimal control of ground-water quality management: Nonlinear programming approach. *Journal of Water Resources Planning and Management*, 120(6):962-982.

*Groundwater management / Water quality / Models / Optimization / Policy / USA / California*

(Location: HQ Call No: PER Record No: H 15591)

14146. **Tajrishy, M.A.; Hills, D.J.; Tchobanoglous, G. 1994.** Pretreatment of secondary effluent for drip irriga-

tion. *Journal of Irrigation and Drainage Engineering*, 120(4):716-731.

*Drip irrigation / Irrigation equipment / Irrigation design / Effluents / Waste water management / Water quality*

(Location: HQ Call No: PER Record No: H 14963)

**Abstract:** A pilot-scale treatment system, for developing drip-irrigation pretreatment criteria, was designed, installed, and operated intermittently over 5,300 h using activated sludge secondary effluent. Principal unit processes studied were granular-medium filtration and screen filters for removal of suspended solids, and chlorination treatment at various injection frequencies and concentrations to prevent biofilm formation in emitters and distribution lines. Two types of 4 L/h (1 gal./h) drip emitters were tested - automatic self-flushing and tortuous-path turbulent-flow emitters. Adequate filtration reduced both the required frequency of chlorination and lateral flushing. Intermittent chlorination with 2 mg/L free residual chlorine during the last hour of an irrigation cycle was found as effective as continuous chlorination with 0.4 mg/L free residual chlorine in preventing biofilm formation in emitters and distribution networks. Pretreatment recommendations for these types of emitter designs are presented.

14147. **Tang, H.; Van Ranst, E. 1992.** Modelling production of irrigated maize considering management and environmental conditions in Haichen County, China. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in co-operation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.657-666.*

*Crop production / Maize / Irrigated farming / Environmental effects / Models / China / Haichen County*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14446)

14148. **Tangaya, K. 1994.** The electrical pumping project. In FAO, *Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.231-234.*

*Pumping / Irrigation programs / Maintenance / Water users' associations / Thailand*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14880)

14149. Taniyama, S.; Sakagami, S.; Nakajima, K.; Yoshino, H. 1993. Redevelopment of canal system meeting changes in regional water demand structure (with specific reference to Aichi Irrigation Canal System) In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.815-824.

*Water demand / Irrigation canals / Irrigation programs / Irrigation requirements / Water management / Reservoirs / Japan*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15248)

14150. Tanji, K.K. 1977. A conceptual hydrosalinity model for predicting salt load in irrigation return flows. In Managing saline water for irrigation. Texas, TX, USA: Texas Tech University. pp.49-70.

*Salinity / Water management / Models / Flow discharge / Water quality / Calibrations / USA*

(Location: HQ Call No: P 3260 Record No: H 13738)

14151. Teixeira, J.L.; Fernando, R.M.; Pereira, L.S. 1991. Scheduling irrigation with limited water supply using a simulation model. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.183-199.

*Irrigation scheduling / Simulation models / Irrigation management / Crop yield / Maize / Wheat / Water availability / Tunisia*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14739)

14152. Tollner, E.W.; Tyson, A.W.; Beverly, R.B. 1991. Estimating the number of soil-water measurement stations required for irrigation decisions. 7(2):198-204.

*Irrigation management / Soil water relations / Decision making / Water measurement*

(Location: HQ Call No: P 3334 Record No: H 14016)

14153. Tsakiris, G. 1992. A rational approach for irrigation design assessment. In Feyen, J.; Mwendera, E.; Badji, M.(Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.3. Leuven, Belgium: Center for Irrigation Engineering. pp.915-922.

*Irrigation design / Computer techniques / Networks / Farms / Greece*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14472)

14154. Tyagi, K.C.; Pillai, N.N.; Tyagi, N.K. 1993. Groundwater simulation for planning salinity control: A case study. ICID Bulletin, 42(1):33-50.

*Groundwater / Salinity control / Simulation models / Water table / Case studies / Waterlogging / India / Haryana*

(Location: HQ Call No: PER Record No: H 13963)

**Abstract:** Waterlogging and salinization due to rise in water table is a growing problem in parts of Lower Ghaggar Basin in Bhakra Canal Command area. An existing groundwater simulation model (developed by Tyson and Weber, 1964) to predict water table behavior has been calibrated with historical data. The verified model was used to predict water table levels upto 2000 A.D. under different irrigation system improvement scenarios. Projections of waterlogged area, made through simulation studies, indicated that, of the total area of 490,000 ha, 70 percent will reach critical water table level of less than 3.0 m, and nearly 280,000 ha (57% of the total area) will have water table within 1.0 m by 2000 A.D. if irrigation system is not improved. This calls for the introduction of waterlogging prevention measures. Irrigation system improvements in the form of lining of watercourses, minor and distributaries and improvement of on-farm management could reduce the groundwater accretion by 75% of the existing levels and thereby reduce the waterlogging. The differential rate of rise in water table in different parts of the area provides scope for carrying out improvement over a period of time.

14155. Tyagi, N.K. 1993. An algorithm for minimizing abstraction and reuse costs of drainage effluents. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century: Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1395-1407.

*Subsurface drainage / Environmental effects / Effluents / Water reuse / Irrigated farming / Shallow tube wells / Salinity / Models / Constraints / India*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14207)

14156. Tyagi, N.K.; Bhirud, S.; Jaiswal, C.S.; Tyagi, K.C. 1992. Improving canal water utilization efficiency through conjunctive use. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven,

Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.505-514.

*Water resources / Irrigation canals / Groundwater / Water demand / Crop production / Waterlogging / Salinity / Arid zones / Water use efficiency / Conjunctive use / India / Haryana*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14431)

14157. **Tyagi, N.K. 1988.** Managing salinity through conjunctive use of water resources. Ecological Modelling, 40:11-24.

*Salinity / Water quality / Water resource management / Conjunctive use / Groundwater / Surface water / Waterlogging / Land reclamation / India*

(Location: HQ Call No: P 3258 Record No: H 13736)

14158. **Ubels, J.; Horst, L. (Eds.) 1993.** Irrigation design in Africa: Towards an interactive method. Wageningen, Netherlands: Wageningen Agricultural University. 115p.

*Irrigation design / Irrigation systems / Farming systems / Social aspects / Households / Labor / Water distribution / Women / Farmers' associations / Villages / Irrigation programs / Farmer-agency interactions / Farmer managed irrigation systems / Africa South of Sahara / Senegal / Zimbabwe / Kenya / Gambia*

(Location: HQ Call No: 631.7.1 G100 UBE Record No: H 13910)

14159. **Valiantzas, J.D. 1993.** Border advance using improved volume-balance model. Journal of Irrigation and Drainage Engineering, 119(6):1006-1013.

*Border irrigation / Mathematical models / Costs*  
(Location: HQ Call No: PER Record No: H 13674)

**Abstract:** A simple cost-efficient model is developed to predict advance phase in border irrigation. Assuming a power function for the water-depth profile, a volume-balance equation is applied using an adjusted surface shape factor. In addition, the zero-inertia motion equation is evaluated at the upstream end of the border. A system of two equations containing two unknowns (the advance position and the water depth at the head of the border) is thus constructed and solved at each time step. Comparison of dimensionless advance trajectory and surface-profile solutions indicate that predictions of the present method are in agreement with zero-inertia solutions. The proposed model is also tested for four well-documented field irrigations. It is shown that even for level or small slope borders for which the traditional volume-balance models give poor results, the proposed method is accurate. Programming requirements and computation cost of the present method are significantly less than for sophisticated models.

14160. **van Bentum, R.; Smout, I.K. 1993.** Planning and design of buried pipe distribution system for surface irrigation. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.537-554.

*Surface irrigation / Pipes / Water distribution / Irrigation design*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15226)

14161. **van den Bosch, B.E.; Snellen, W.B.; Brouwer, C.; Hatcho, N. 1993.** Structures for water control and distribution. Rome, Italy: FAO. viii, 67p. (Irrigation water management training manual no.8)

*Water control / Water distribution / Training / Weirs / Open channels / Flow control / Flow measurement / Discharges / Maintenance*

(Location: HQ Call No: 631.7.1 G000 VAN Record No: H 14549)

14162. **Vanoni, V.A. (Ed.) 1977.** Sedimentation engineering. New York, NY, USA: ASCE. xvi, 745p.

*Sedimentation / Measurement / Water conservation / Land / Erosion / Hydraulics / Reservoirs / Pipes / Canals / Economic aspects / Legal aspects / Surface water*

(Location: HQ Call No: 631.7.1 G000 VAN Record No: H 14126)

14163. **Varshney, R.S. 1993.** Need for engineers' active involvement and commitment for proper maintenance of irrigation systems. In Jurriens, M.; Jain, K.P. (Eds.), Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands. New Delhi, India: ILRI/WALMI. pp.135-144.

*Maintenance / Irrigation systems / Irrigation canals / Irrigation engineering / India*

(Location: HQ Call No: 631.7.1 G635 JUR Record No: H 15139)

14164. **Vedula, S.; Ramasesha, C.S.; Rao, A.A.; Prasad, B.S. 1986.** Computer model for Vedavati ground water basin. Part 3. Irrigation potential. Sadhana, 9(1):57-68.

*Groundwater potential / Groundwater development / Computer models / River basins / Crops / Water requirements / Water potential / Simulation / India / Karnataka*

(Location: HQ Call No: P 3521 Record No: H 14710)

14165. **Vedula, S. 1978.** Optimal planning for reservoir irrigation. Paper presented at the 5th National Systems Conference, PAU, Ludhiana, India, 4-6 September 1978. pp.106-109.

- Reservoirs / Irrigation management / Mathematical models / Linear programming / Cropping systems / India / Karnataka*  
(Location: HQ Call No: P 3530 Record No: H 14755)
14166. **Vedula, S.; Mohan, S. 1990.** Real-time multipurpose reservoir operation: A case study. *Hydrological Sciences Journal*, 35(4,8):447-462.  
*Reservoir operation / Computer models / Stochastic process / Operating policies / Simulation models / Irrigation / Hydroelectric schemes / Case studies / India / Karnataka / Bhadra Reservoir*  
(Location: HQ Call No: P 3525 Record No: H 14750)
14167. **Venugopal, K.; Sakthivadivel, R.; Rama Murthy, K. 1991.** Irrigation scheduling of Periyar Vaigai System - Planning through simulation. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.220-229.  
*Irrigation scheduling / Simulation models / Water allocation / India / Tamil Nadu*  
(Location: HQ, ICID Call No: ICID 631.7 G000 ICI Record No: H 14742)
14168. **Verbrugge, P.P.; Lobbrecht, A.H. 1993.** Automated water-level control in the Flevopolders (NL) Analysis of effects on operational water management. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.271-282.  
*Water control / Water management / Canal regulation techniques / Pumping / Operating costs / Automation / Netherlands*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15083)
14169. **Verdier, J.; Millo, J.L. 1992.** Maintenance of irrigation systems. France: Ministry of Cooperation and Development. v.p.  
*Irrigation systems / Maintenance / France*  
(Location: ICID Record No: 26046)
14170. **Verdier, J.; Millo, J.L. 1994.** Maintenance of irrigation systems: A practical guide for system managers. France: French National Committee, ICID. 243p. (ICID paper no.40)  
*Irrigation systems / Maintenance*  
(Location: ICID Record No: 26162)
14171. **Visser, T.N.M.; Wolters, W.; Smit, M.F.R.; Khalek, M.A. 1993.** Effect of reuse on irrigation efficiencies in the Eastern Nile Delta, Egypt using the SIWARE model. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1485-1500.  
*Water reuse / Water quality / Drainage / Irrigation efficiency / Simulation models / Performance / Evapotranspiration / Constraints / Egypt / Nile River*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15492)
14172. **von Lany, P.H.; Chidley, T.R.E.; Wallace, M.F. 1993.** Optimisation modelling in water resource development planning. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century. Transactions: Vol.1-G, Special session - Irrigation and drainage in competition for water. New Delhi, India: ICID. pp.1-14.  
*Water resources development / Water resource management / Planning / Surface water / River basin development / Sustainability / Water allocation / Optimization methods / Simulation models / Linear programming / Computer techniques / GIS / Africa / Asia*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15718)
14173. **Vories, E.D.; von Bernuth, R.D. 1986.** Single nozzle sprinkler performance in wind. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.1325-1330.  
*Sprinkler irrigation / Irrigation systems / Models / Research / USA*  
(Location: HQ Call No: 631.4 G000 AME Record No: H 13863)
14174. **Vuckovic, D.; Mihic, D. 1992.** Optimization of "Nadela" water resources system. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.275-283.  
*Water resources / Optimization methods / Drainage / Irrigation / Large-scale systems / Open channels / Mathematical models / Design criteria / Yugoslavia / Belgrade*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14356)  
**Abstract:** This paper discusses a possible solution for reconstruction of large systems aiming to take as much advantage from existing hydraulic structures as possible. An example presented here shows reconstruction of the "Nadela" drainage system into the system which can be used for both the irrigation and drainage. In order to evaluate as many alternatives as possible and to provide

technically and financially appropriate solutions, designers applied a kind of the optimization procedure. The design followed these previous evaluations, it was precisely defined and easily carried out proving in advance that the resulting solution is suitable, especially from financial viewpoint.

14175. **Wang, Z. 1991.** The effect of utilization of hyper-concentrated flow and its conveying in Baogixia Weihui Irrigation District. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.172-182.

*Water shortage / Water conveyance / Irrigation canals / China*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 14738)

14176. **Wangchuk, K. 1994.** Improved operation and maintenance of lift irrigation system. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.110-111.

*Water lifting / Irrigation practices / Bhutan*

(Location: HQ Call No: 631.7.6.3 G750 FAO  
Record No: H 14865)

14177. **Wathanayomnarn, A.; Horii, K.; Usuki, N.; Yamamoto, H. 1994.** Improved on-farm water management in the Sam Chuk Project in Thailand. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.68-78.

*Water management / Water demand / Computer techniques / Irrigation efficiency / Water distribution / Irrigation programs / Field tests / Thailand*

(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15202)

14178. **Watt, S.B. 1978.** A manual on the hydraulic ram for pumping water. London, UK: Intermediate Technology Publications. vi, 40p.

*Pumping / Pumps / Design / Maintenance / Water lifting / Irrigation equipment / Technology*

(Location: HQ Call No: 631.7.1 G000 WAT  
Record No: H 14264)

14179. **Wegener, D.H. 1993.** Sediment exclusion from riverside pumping plant for pipeline distribution systems. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century: Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1385-1394.

*Sedimentation / Control methods / River basin development / Irrigation programs / Pipes / Pumping / Design / Water quality / USA / Washington / Okanogan River*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 14182)

14180. **Weidner, R.; Héritier, M. 1993.** La maintenance des reseaux d'irrigation. [Maintenance of irrigation networks] ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-F, Question 45, R30-R49: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.507-521.

*Irrigation management / Networks / Maintenance / Farmers' associations / Water rates / Economic aspects / France*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15648)

14181. **Wenberg, R.D. 1993.** Design and management of controlled drainage and irrigation systems for improved water quality. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century: Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1439-1446.

*Irrigation systems / Subsurface drainage / Design / Water quality / Water table / Computer models / USA*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15488)

14182. **Wenyan, W.; Bing, S.; Zhilu, L. 1994.** Drain-spacing calculation considering influence of evaporation. Journal of Irrigation and Drainage Engineering, 120(3):563-572.

*Groundwater / Evaporation / Drainage / Mathematical models*

(Location: HQ Call No: PER Record No: H 14416)

14183. **Westesen, G.L.; LeRoy, P. 1992.** Field manufacture and application of reinforced plastic canal and pipe linings. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.789-794.

*Canal linings / Pipes*

(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14459)

14184. **Wijesekera, U.S. 1994.** Setting up a computerized information system at the main-canal level: Sri Lankan experience, Kirindi Oya System. In Haq, K.A.; Rey, J.; Sakthivadivel, R.; Samarasekera, B.M.S. (Eds.), Use of computer-operated models as decision-support tools in operation and management of irrigation systems: Sri Lankan experience - Proceedings of the Workshop on the Use of Computer-Operated Models as Decision-Support Tools in Operation and Management of Irrigation Systems held in Galgamuwa, Sri Lanka from 15 to 16 July 1993. Colombo, Sri Lanka: IIMI. pp.27-28.  
*Computer techniques / Management Information Systems / Irrigation canals / Water distribution / Case studies / Sri Lanka / Kirindi Oya*  
(Location: HQ Call No: IIMI 631.7.1 G744 HAQ Record No: H 15128)
14185. **Wijetunga, A. 1994.** Uda Walawe Irrigation Project: Use of a computer-operated model for water scheduling. In Haq, K.A.; Rey, J.; Sakthivadivel, R.; Samarasekera, B.M.S. (Eds.), Use of computer-operated models as decision-support tools in operation and management of irrigation systems: Sri Lankan experience - Proceedings of the Workshop on the Use of Computer-Operated Models as Decision-Support Tools in Operation and Management of Irrigation Systems held in Galgamuwa, Sri Lanka from 15 to 16 July 1993. Colombo, Sri Lanka: IIMI. pp.21-22.  
*Computer techniques / Computer models / Irrigation scheduling / Irrigation management / Irrigation canals / Sri Lanka / Uda Walawe*  
(Location: HQ Call No: IIMI 631.7.1 G744 HAQ Record No: H 15126)
14186. **Willet, H. 1994.** Design of water distribution procedures in irrigation management transfer: A crucial step. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.317-321.  
*Water distribution / Design / Irrigation management / Privatization*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15468)
14187. **Wimalaratna, W.G. 1994.** Computer applications in water scheduling and system operations in Hakwatuna Oya Tank Project, Hiriyala Division, North Western Province. In Haq, K.A.; Rey, J.; Sakthivadivel, R.; Samarasekera, B.M.S.(Eds.), Use of computer-operated models as decision-support tools in operation and management of irrigation systems: Sri Lankan experience - Proceedings of the Workshop on the Use of Computer-Operated Models as Decision-Support Tools in Operation and Management of Irrigation Systems held in Galgamuwa, Sri Lanka from 15 to 16 July 1993. Colombo, Sri Lanka: IIMI. pp.7-8.  
*Management Information Systems / Computer techniques / Computer models / Computer software / Irrigation scheduling / Water delivery / Monitoring / Water resource management / Sri Lanka / Hakwatuna Oya Project*  
(Location: HQ Call No: IIMI 631.7.1 G744 HAQ Record No: H 15119)
14188. **Withers, B.; Vipond, S. 1974.** Irrigation: Design and practice. London, UK: B.T. Batsford. 306p.  
*Irrigation design / Irrigation engineering / Feasibility studies / Irrigation practices / Soil moisture / Crop-based irrigation / Evaporation / Soil classification / Irrigation systems / Drainage / Surface drainage / Subsurface drainage / Irrigation canals / Flow measurement / Flumes / Weirs/ Open channels / Irrigation management / Drip irrigation / Soil water movement / Infiltration / Border irrigation / Sprinkler irrigation*  
(Location: HQ Call No: 631.7.1 G000 WIT Record No: H 14075)
14189. **Wolde-Kirkos, A.T.; Chawla, A.S. 1994.** Seepage from canal to asymmetric drainages. Journal of Irrigation and Drainage Engineering, 120(5):949-956.  
*Seepage loss / Irrigation canals / Drainage*  
(Location: HQ Call No: PER Record No: H 15374)
14190. **Wolff, P.; Hubener, R. 1992.** Development of sprinkler irrigation equipment in Germany between the two world wars. Irrigation News, 21:15-27.  
*Sprinkler irrigation / Irrigation equipment / History / Germany*  
(Location: HQ Call No: P 3395 Record No: H 14240)
14191. **Wolff, P.; Huebener, R. 1994.** Technological innovations in irrigated agriculture. In Heim, F.; Abernethy, C.L.(Eds.), Irrigated agriculture in Southeast Asia beyond 2000: Proceedings of a Workshop held at Langkawi, Malaysia, 5 to 9 October 1992. Colombo, Sri Lanka: IIMI; DSE. pp.115-125.  
*Irrigation engineering / Technology / Water delivery / Water conveyance / Developing countries / Irrigated farming / Water lifting / Pumps / Irrigation systems / Basin irrigation / Surge irrigation / Sprinkler irrigation / Drip irrigation / Constraints*  
(Location: HQ Call No: IIMI 631.7.8 G800 HEI Record No: H 15275)
14192. **Wolter, H. 1994.** Capacity building to implement supervisory control systems in China and India. Grid, 4:10.  
*Irrigation canals / Water management / Computer techniques / Computer software / Remote sensing / China / India*  
(Location: HQ Call No: P 3338 Record No: H 14027)
14193. **Wright, S.J.; Tullis, B.P.; Long, T.M. 1994.** Recalibration of parshall flumes at low discharges. Journal of Irrigation and Drainage Engineering, 120(2):348-362.

*Flumes / Mathematical models / Simulation models / Flow discharge / Calibrations*

(Location: HQ Call No: PER Record No: H 14098)

14194. **Wu, I.P. 1993.** Design considerations of drip irrigation systems. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72. Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.693-711.

*Design criteria / Drip irrigation / Crop production / Water requirements / Computer techniques / Simulation / Soil moisture*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15238)

14195. **Wyatt, A. 199?** A primer on investigating and reducing water loss in water systems in developing countries. Arlington, VA, USA: WASH. 8p. (WASH technical note)

*Water loss / Developing countries*

(Location: ODI Call No: R-WASH TN Record No: L 942724)

14196. **Wyseure, G.C.L.; Gowing, J.W. 1992.** Field studies in Malaysia: A joint programme by Universiti Pertanian Malaysia and University of Newcastle Upon Tyne. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in co-operation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.853-858.

*Agricultural research / Field tests / Irrigated farming / Irrigation engineering / Irrigation management / Training / Malaysia / UK*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14467)

14197. **Xanthoulis, D. 1992.** Surface irrigation efficiency in function of water quality. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.409-417.

*Surface irrigation / Irrigation efficiency / Water quality / Waste waters / Simulation models / Infiltration / USA / California*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14369)

**Abstract:** A cost-effective method of disposing cannery wastewater is to surface irrigate crops which produce income. Even if well managed, applied water may be lost to surface runoff and to percolation below the rootzone and pollute ground water and surface water. Using a hydraulic model to simulate irrigation performance, it was shown that ignoring the decline in infiltration with increased loading and unadjusted infiltration function reduced predicted application efficiency 23%. Knowledge of wastewater quality and how it affects infiltration is required to determine the flow rate and duration of irrigation such that the crop is adequately irrigated and pollution from tailwater and deep percolation is controlled.

14198. **Xionghan, Y.; Xuannian, G. 1991.** Energy-saving type intake works for medium and minor irrigation districts in watershed with abundance of water. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.306-314.

*Energy consumption / Watersheds / Water control / Irrigation engineering / China*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14747)

14199. **Yamada, M. 1993.** Unsteady flow analysis on tidal low-lying land development in Southeast Asia. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, R1-R35: Planning and design of irrigation and drainage systems. pp.299-315.

*River basin development / Flow discharge / Mathematical models / Simulation models / Land development / Hydraulics / Drainage / South East Asia / Japan / Thailand / Malaysia / Bang Nara River*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15085)

14200. **Yamashita, S.; Walker, W.R. 1994.** Command area water demands I: Validation and calibration of UCA model. Journal of Irrigation and Drainage Engineering, 120(6):1025-1042.

*Water demand / Calibrations / Irrigation canals / Soil moisture / Simulation models / Computer models*

(Location: HQ Call No: PER Record No: H 15680)

14201. **Yamashita, S.; Walker, W.R. 1994.** Command area water demands II: Water-demand function. Journal of Irrigation and Drainage Engineering, 120(6):1043-1055.

*Water demand / Calibrations / Irrigation canals / Soil moisture / Simulation models / Computer models / Statistical analysis*

(Location: HQ Call No: PER Record No: H 15681)



14202. **Yaxin, C.; Guangyun, N. 1993.** The evaluation of irrigation efficiency and a water saving strategy for Hetao, China. *ICID Bulletin*, 42(2):11-21.

*Irrigation efficiency / Water conservation / Water use efficiency / Irrigation canals / Case studies / Performance evaluation / China / Hetao*

(Location: HQ Call No: PER Record No: H 14495)

**Abstract:** This paper evaluates the irrigation efficiency in the Hetao irrigation area. Based on standardized calculations and measurements from 1985 to 1989, methods to appraise irrigation systems in arid regions have been developed. These are the mathematical statistic method of evaluating canal conveyance efficiency; the fuzzy grouping method to analyse the soil permeability of a canal bed; and the dynamic method to evaluate field water efficiency under the conditions of existing shallow ground water. Based on the results, the potential water saving in planning, operating and managing irrigation systems is pointed out and corresponding strategies in water saving are recommended.

14203. **Yaxin, C.; Guangyun, N. 1991.** Evaluation of irrigation efficiency and water saving strategy of Hetao Irrigation Area of China. In *ICID, The Special Technical Session: Proceedings*, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.61-70.

*Irrigation efficiency / Water conservation / Irrigation canals / Performance evaluation / Mathematical models / Case studies / China*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14915)

14204. **Ye, C.; Hubrechts, L.; Feyen, J. 1992.** Evaluation of DMISA decision support system for the management of the field irrigation schedule of medium to large scale irrigation schemes. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management*, Leuven, Belgium, 14-17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.717-726.

*Large-scale systems / Decision support tools / Irrigation management / Irrigation scheduling / Simulation models / Computer software / Soil water / Evaluation / Belgium / Kinrooi Irrigation Scheme*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14452)

14205. **Ygnatov, P.; Ognianova, R.; Petrova, S. 1993.** Natural water treatment hydroautomatic filters for drop irrigation. In *ICID, 15th International Congress on Irrigation and Drainage*, The Hague, The Netherlands, 1993:

Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72. Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.797-806.

*Hydraulics / Filtration / Bulgaria*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15246)

14206. **Yuan, H.; Liu, Z.; Zhang, S. 1991.** A study on the optimal allocation model of limited irrigation water. In *ICID, The Special Technical Session Proceedings*, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.125-135.

*Water allocation / Water shortage / Mathematical models / Crop yield / Optimization / Irrigation scheduling / China*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14734)

14207. **Yussuff, S.M.H.; Chauhan, H.S.; Kumar, M.; Srivastava, V.K. 1994.** Transient canal seepage to sloping aquifer. *Journal of Irrigation and Drainage Engineering*, 120(1):97-109.

*Irrigation canals / Seepage / Water distribution / Aquifers / Water table*

(Location: HQ Call No: PER Record No: H 13879)

**Abstract:** The problem of seepage from an unlined earthen canal is considered. The phreatic surface generated on the two sides of the canal is characterized by the nonlinear Boussinesq equation incorporating the slope element. A closed-form analytical solution to be linearized Boussinesq equation was derived. A finite-difference solution to the nonlinear Boussinesq equation was also obtained using the unconditionally stable Du Fort- Frankel explicit method for the seepage problem in the semi infinite flow problem. The numerical solution in general predicted a higher phreatic surface than the analytical solution.

14208. **Zanamwe, S.; van Harderwijk, W. 1994.** The si-wil pipe-lifting device. *Waterlines*, 12(3):30-31.

*Water lifting / Pipes / Low lift pumps*

(Location: HQ Call No: PER Record No: H 14377)

14209. **Zara, P.M.; Selley, R.; Cahoon, J.E.; Ferguson, R. 1994.** Simulating N leaching in furrow irrigated corn. *Irrigation Science*, 15(4):167-172.

*Furrow irrigation / Maize / Leaching / Infiltration / Simulation models / Crop yield / Environment / Surface irrigation / Irrigation practices*

(Location: HQ Call No: PER Record No: H 15697)

14210. **Zhang, Y.; Wang, J. 1991.** Stochastic dynamic programming for regional exploitation of shallow groundwater resources. In *ICID, The Special Technical Session*

Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.77-82.

*Groundwater management / Stochastic process / Recharge / Aquifers / Systems analysis / China / Henan Province / Shangqiu County*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14730)

14211. **Zhaoyi, L.; Zonglou, G. 1993.** A study on real-time operation of irrigation system. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-G, Symposium. R.6. New Delhi, India: ICID. pp.81-95.

*Mathematical models / Reservoirs / Water supply / Water demand / Forecasting / Irrigation requirements / Case studies / China / Hubei Province*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15732)

14212. **Zheng, X. 1991.** Energy conservation for irrigation and drainage machinery systems. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.254-275.

*Irrigation equipment / Drainage / Energy consumption / Pumps / China*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14744)

14213. **Zhi, M. 1994.** Forecast of crop evapotranspiration. ICID Bulletin, 43(1):23-36.

*Evapotranspiration / Forecasting / Mathematical models / Soil moisture / Rice / Paddy fields / Water conservation*  
(Location: HQ Call No: PER Record No: H 15639)

14214. **Zuniga Rivera, J.G. 1992.** How can we begin to view the two systems, man-made and natural, as one system with engineering and ecological components? In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.117-124.

*Watershed management / Water quality / Irrigation engineering / Ecology / Honduras*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14342)

**Abstract:** The aim of this paper is to give a better idea of the need to be aware of the situation of watershed protection as well as water quality and help the engineers to look at the water system or an

irrigation system as a total process from the first drop of rain water to the faucet by the house or to the crop roots. This study is intended to be helpful in estimating the degree to which specific problems, such as deforestation and erosion, have effected community watersheds, water quality, and water quantity. This result is supported here by a tabular presentation of data of small watersheds in Honduras, which compares the observations of the field. The results is placed on simple techniques for protection of watershed and water quality, and on important people considerations. These tasks can be some of the most difficult ones. However, they are a key to the ongoing success of an irrigation or water project.

14215. **Zur, B.; Ben-Hanan, U.; Rimmer, A.; Yardeni, A. 1994.** Control of irrigation amounts using velocity and position of wetting front. Irrigation Science, 14(4):207-212.

*Water control / Soil water relations / Infiltration*  
(Location: HQ Call No: PER Record No: H 14674)

14216. **Zysset, A.; Stauffer, F.; Dracos, T. 1994.** Modeling of reactive groundwater transport governed by biodegradation. Water Resources Research, 30(8):2423-2434.

*Groundwater / Mathematical models / Simulation / Water resource management*  
(Location: HQ Call No: PER Record No: H 15500)

#### Agronomic aspects

14217. **Abdel-Dayem, S.; El Atfy, H.; El-Gammal, H. 1993.** Regional and seasonal changes of subsurface drainage water in Egypt. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993. Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.145-156.

*Subsurface drainage / Salinity / Monitoring / Egypt / Nile River*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15073)

14218. **Abou-Hadid, A.F. 1993.** Climatic factor in plastic houses and their possible effect on plant water requirements. In CIHEAM; IAM-B, Workshop on environmentally sound water management of protected agriculture under Mediterranean and arid climates, Bari, Italy, 16-18 July 1993. Bari, Italy: CIHEAM. pp.2.3-2.36.

*Water requirements / Plant protection / Climate*  
(Location: HQ Call No: 333.91 GG20 CIH Record No: H 13974)

14219. **Agrawal, R.P. 1992.** Low input strategies and use of poor quality ground-water for crop production in semi-arid environment of North-West India. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning,

design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.3. Leuven, Belgium: Center for Irrigation Engineering. pp.955-963.

*Groundwater / Water quality / Crop production / Infiltration / Soil properties / Sprinkler irrigation / Drip irrigation / Water use efficiency / India*  
(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14475)

14220. **Ahmed, M.I.** 1993. The Rahad crop yields locational differences based on crop-cutting survey results along selected major canals. Report on the field work carried out during a two day seminar training the field staff of Rahad Agricultural Corporation, November 1993. 13p.

*Irrigation canals / Crop yield / Water distribution / Tenancy / Irrigation programs / Sudan / Rahad Scheme*  
(Location: HQ Call No: P 3535 Record No: H 14772)

14221. **Alves, I.L.; Fontes, J.C.; Pereira, L.S.** 1991. Water-yield relations for corn: Summary. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. pp.154-161.

*Mathematical models / Maize / Cereals / Crop production / Crop yield / Irrigation scheduling / Calibrations / Water requirements / Water stress / Water shortage*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 14897)

14222. **Alvino, A.; Zerbi, G.** 1986. Water-table level effect on the yield of irrigated and unirrigated grain maize. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.1086-1089.

*Water table / Irrigation effects / Crop yield / Maize / Rain-fed farming / Irrigated farming*  
(Location: HQ Call No: 631.4 G000 AME Record No: H 13859)

14223. **Amer, S.A.; Keefer, T.O.; Weltz, M.A.; Goodrich, D.C.; Bach, L.B.** 1994. Soil moisture sensors for continuous monitoring. Water Resources Bulletin, 30(1):69-83.

*Soil moisture / Soil water / Infiltration / Measuring instruments / Calibrations / USA / Arizona*  
(Location: HQ Call No: PER Record No: H 14279)

14224. **Anaç, S.; Ui, M.A.; Tüzel, I.H.** 1992. Corn yield as affected by deficit irrigation. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable

land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.795-800.

*Maize / Crop yield / Water deficit / Yield response functions / Water stress / Irrigated farming / Water use efficiency / Turkey*

(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14460)

14225. **Anaç, S.; Anaç, D.** 1992. Effect of different drainage conditions on rice yield and nitrogen loss. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.681-686.

*Rice / Crop yield / Drainage / Irrigation requirements / Nitrogen / Fertilizers / Turkey / Bornova*

(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14448)

14226. **Annandale, J.G.; Stockle, C.O.** 1994. Fluctuation of crop evapotranspiration coefficients with weather: A sensitivity analysis. Irrigation Science, 15(1):1-7.

*Evapotranspiration / Crops / Soil moisture / Environmental effects*

(Location: HQ Call No: PER Record No: H 15382)

14227. **Antonopoulos, V.Z.** 1993. Simulation of water and nitrogen dynamics in soils during wastewater applications by using a finite-element model. Water Resources Management, 7(3):237-251.

*Soil water relations / Mathematical models / Waste waters / Simulation models / Nitrogen*

(Location: HQ Call No: PER Record No: H 12027)

**Abstract:** A mathematical model was developed to simulate water movement, mass transport, and nitrogen transformations in soils during wastewater applications. The model is one-dimensional and based on the Galerkin finite-element method. The submodel of mass transport of nitrogen incorporates the convection-dispersion processes of ammonium and nitrate nitrogen, nitrification, denitrification, ammonium exchange and uptake of ammonium and nitrate ions. The accuracy and validity of the proposed model was examined by comparison with an explicit-implicit finite-difference model results. The model was used for simulation of water and nitrogen dynamics during wastewater application in

homogeneous and multi-layered soils under different N concentration, rate, duration and scheduling of application.

14228. **Apland, J.; McCarl, B.A.; Miller, W.L. 1980.** Risk and the demand for supplemental irrigation: A case study in the corn belt. *American Journal of Agricultural Economics*, February:142-145.

*Irrigation requirements / Mathematical models / Maize / Crop production / Water demand*

(Location: HQ Call No: P 3585 Record No: H 15177)

14229. **Ashktorab, H.; Pruitt, W.O.; Paw U.K.T. 1994.** Partitioning of evapotranspiration using lysimeter and micro-bowen-ratio system. *Journal of Irrigation and Drainage Engineering*, 120(2):450-464.

*Evapotranspiration / Soil moisture / Plant growth / USA / California*

(Location: HQ Call No: PER Record No: H 14101)

14230. **Ayars, J.E.; Hutmacher, R.B. 1994.** Crop coefficients for irrigating cotton in the presence of groundwater. *Irrigation Science*, 15(1):45-52.

*Cotton / Crop production / Irrigation scheduling / Groundwater / Lysimetry / Evapotranspiration / USA*

(Location: HQ Call No: PER Record No: H 15387)

14231. **Ayars, J.E.; Hutmacher, R.B.; Schoneman, R.A.; Vail, S.S.; Felleke, D. 1986.** Drip irrigation of cotton with saline drainage water. In *American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water*, Vol.29. St. Joseph, MI, USA: ASAE. pp.1668-1673.

*Drip irrigation / Cotton / Crop yield / Plant growth / Salinity / Water quality / Drainage / Water management / USA / California*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13866)

14232. **Ayars, J.E.; Schoneman, R.A. 1986.** Use of saline water from a shallow water table by cotton. In *American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water*, Vol.29. St. Joseph, MI, USA: ASAE. pp.1674-1678.

*Salinity / Water quality / Water table / Water balance / Cotton / Crop yield / Drainage / Arid zones / Water management / USA / California*

Location: HQ Call No: 631.4 G000 AME Record No: H 13867)

14233. **Aydin, M. 1994.** Hydraulic properties and water balance of clay soil cropped with cotton. *Irrigation Science*, 15(1):17-23.

*Water balance / Clay soils / Cotton / Evapotranspiration / Soil water relations / Drainage / Turkey*

(Location: HQ Call No: PER Record No: H 15384)

14234. **Baille, A. 1993.** Specific objectives and constraints in irrigation management of greenhouse crops under Mediterranean conditions. In *CIHEAM. IAM-B, Workshop on environmentally sound water management of protected agriculture under Mediterranean and arid climates*, Bari, Italy, 16-18 July 1993. Bari, Italy: CIHEAM. pp.7.3-7.25.

*Crop-based irrigation / Irrigation scheduling / Plant protection / Climate / Crop production*

(Location: HQ Call No: 333.91 GG20 CIH Record No: H 13977)

14235. **Bazzocchi, R.; Casalicchio, G. 1993.** A reasoned use of irrigation and fertilization of protected agriculture in arid and Mediterranean climates. In *CIHEAM. IAM-B, Workshop on environmentally sound water management of protected agriculture under Mediterranean and arid climates*, Bari, Italy, 16-18 July 1993. Bari, Italy: CIHEAM. pp.12.3-12.29.

*Water requirements / Plant protection / Subsurface irrigation / Arid zones / Fertilizers*

(Location: HQ Call No: 333.91 GG20 CIH Record No: H 13980)

**Abstract:** After the presentation of the complex problems related to irrigation and fertilization, some alternative techniques for protected crops in arid climates are presented and discussed. Such techniques lead to a real water saving and a reasoned use of nutrients by using either free water or "complexed" water with the addition of a biodegradable product.

14236. **Beltrame, L.F.S.; Louzada, J.A.S.; Dorfman, R. 1993.** Aspects of agricultural hydrology in flood plain soils: Identification of problems and solutions. In *ICID, 15th International Congress on Irrigation and Drainage*, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1285-1296.

*Soil properties / Hydrology / Soil management / Subsurface drainage / Irrigation requirements / Rice / Brazil*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15354)

14237. **Beyrouthy, C.A.; Grigg, B.C.; Norman, R.J.; Wells, B.R. 1994.** Nutrient uptake by rice in response to water management. *Journal of Plant Nutrition*, 17(1):39-55.

*Water requirements / Rice / Flood irrigation / Irrigated farming / USA*

(Location: HQ Call No: P 3463 Record No: H 14601)

14238. **Bharad, G.M.; Bathkal, B.G. 1992.** Yield response of sugarcane to varying irrigation levels. PKV Research Journal, 16(1):62-65.

*Sugarcane / Crop yield / Irrigation effects / India / Maharashtra*

(Location: HQ Call No: P 3304 Record No: H 13926)

14239. **Bhuiyan, S.I.; Alagcan, M.A. 1990.** Diversified cropping in high water table conditions. ASAE Winter Meeting presentation, Chicago, IL, USA 18-21 December 1990. Paper no.902591. 6p.

*Water table / Crops / Maize / Rice / Diversification / Farming systems / Irrigated farming / Agricultural research*

(Location: HQ Call No: P 3359 Record No: H 14174)

14240. **Bhuiyan, S.I. 1991.** Irrigation sustainability in rice-growing Asia. Paper presented at Waterscapes '91: International Conference on Water Management for a Sustainable Environment, Saskatoon, Canada, 4-7 June 1991. 12p.

*Rice / Crop production / Irrigation water / Environmental degradation / Environmental sustainability / Sedimentation / Waterlogging / Water quality / Water pollution / Disease vectors / Asia*

(Location: HQ Call No: P 3364 Record No: H 14179)

14241. **Boonlue, C.; Malano, H.M. 1993.** Relation between crop diversification and operational flexibility in the Thup Salao Irrigation System, Thailand. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72. Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.483-499.

*Crops / Diversification / Policy / Irrigation programs / Computer models / Simulation models / Irrigation operation / Performance evaluation / Decision support tools / Thailand*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15222)

14242. **Bornstein, J.; Skinner, S.P.; Reiling, S.D. 1986.** Economics of subsurface drainage systems for alfalfa hay. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.484-488.

*Subsurface drainage / Investment / Crop yield / Costs / Economic aspects / Returns / USA / New York*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13693)

14243. **Broner, I.; Leibrock, F.R. 1993.** Water conservation practices in surface irrigation. ICID Bulletin, 42(1):1-9.

*Water conservation / Surface irrigation / Surge irrigation / Irrigation efficiency / Irrigation systems / USA / Colorado*

(Location: HQ Call No: PER Record No: H 13961)

**Abstract:** Implementation of relatively new surface irrigation methods in Colorado to conserve water and energy is discussed. Surge irrigation is the intermittent application of surges of water to two sets of furrows. Cabling is the automation of gated pipe irrigation and automatic application of continuous stream size cutback. These two new methods of surface irrigation have the potential for water and energy conservation. Under the project described in this paper, these two irrigation methods were applied in Colorado and were evaluated with regard to their ability to conserve water and energy and to improve irrigation efficiencies. Both methods can be implemented as a permanent, costly installation or as a portable, inexpensive system. Both types of installations were evaluated and studied. For surge, collapsible tubes were used as the distribution pipe which reduced the cost of the irrigation system and made it affordable for developing countries. It was found that surge can be easily adapted to many field conditions while cabling needed considerable adjustments and fine tuning.

14244. **Byerlee, D.; Siddiq, A. 1994.** Has the green revolution been sustained? The quantitative impact of the seed-fertilizer revolution in Pakistan revisited. World Development, 22(9):1345-1361.

*Wheat / Irrigation / Fertilizers / Crop yield / Intensive cropping / Pakistan / Punjab*

(Location: ODI Call No: ODI Journals Record No: L 943143)

14245. **Byerlee, D.; Morris, M. 1993.** Research for marginal environments: Are we underinvested? Food Policy, October:381-393.

*Wheat / Agricultural research / Rain-fed farming / Water requirements / Crop yield*

(Location: HQ Call No: P 3403 Record No: H 14248)

14246. **Camp, C.R.; Busscher, W.J.; Sadler, E.J. 1993.** Microirrigation systems for deficit irrigation in humid areas. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.237-249.

*Small scale systems / Irrigation systems / Plant growth / Water stress / Maize / Cotton / USA*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15080)

14247. **Cao, J.R.; Zhang, G.S. 1994.** Water resources and the approaches to alleviating irrigation water shortage in

the Hebei Plain, China. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.15-18.

*Irrigation water / Water shortage / Water resources / Water management / Water conservation / Seepage / Surface irrigation / China*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15546)

14248. **Carefoot, J.M.; Major, D.J. 1994.** Effect of irrigation application depth on cereal production in the semi-arid climate of southern Alberta. *Irrigation Science*, 15(1):9-16.

*Cereals / Crop production / Crop yield / Plant growth / Irrigation water / Water use efficiency / Wheat / Soil-water-plant relationships / Canada / Alberta*

(Location: HQ Call No: PER Record No: H 15383)

14249. **Carter, D.L.; Brockway, C.E.; Tanji, K.K. 1993.** Controlling erosion and sediment loss from furrow-irrigated cropland. *Journal of Irrigation and Drainage Engineering*, 119(6):975-988.

*Erosion / Sedimentation / Furrow irrigation / Pipes / Irrigation water / Water management / Watersheds / Environmental effects / USA / California / Idaho / Wyoming / Washington*

(Location: HQ Call No: PER Record No: H 13672)

**Abstract:** Irrigation-induced erosion and subsequent sediment loss is a serious agricultural and environmental problem. Recent recognition of this problem has stimulated the development and evaluation of erosion and sediment-loss control technology. Research results indicate that the application of the technology available today can reduce sediment loss by 70-100%. Important practices include irrigation-water-management, sediment-retention basins, buried-pipe tailwater-control systems, vegetative filter strips, tailwater-recovery systems, keeping crop residues on the soil surface and in furrows, and implementing conservation tillage practices.

14250. **Carter, D.L. 1993.** Furrow irrigation erosion lowers soil productivity. *Journal of Irrigation and Drainage Engineering*, 119(6):964-974.

*Erosion / Furrow irrigation / Crop production / Crop yield / USA / Idaho*

(Location: HQ Call No: PER Record No: H 13671)

**Abstract:** Recent research efforts have shown that soil erosion decreases soil productivity. Erosion-caused crop production decreases of 15-40% are commonly reported with some values over 50%. Furrow erosion on irrigated land in Idaho decreases topsoil depth on the upslope approximately 33% of the field area and may

increase topsoil depth on the downslope 50-55%. Crop yields are generally decreased where topsoil depths are decreased, but yields are not generally increased where topsoil depths are increased beyond a critical depth. Crops vary in their sensitivity to decreases in topsoil depth, but all crops studied exhibited lower yields on the eroded areas. Soil productivity potential of one area representing several million ha of furrow irrigated land was reduced at least 25% by furrow erosion over 80 irrigation seasons. Technology is not available to restore soil productivity potential to the level that would exist had there been no erosion except for returning topsoil to eroded areas. Research and technology applications are needed to reduce or eliminate topsoil loss and redistribution by irrigation erosion.

14251. **Castaneda, A.R.; Bhuiyan, S.I. 1988.** Industrial pollution of irrigation water and its effects on riceland productivity. *Philippine Journal of Crop Science*, 13(1):27-35.

*Irrigation water / Water quality / Water pollution / Rice / Crop production / Sedimentation / Soil properties / Philippines*

(Location: HQ Call No: P 3363 Record No: H 14178)

14252. **Castilla, N. 1993.** Greenhouse drip irrigation management for Mediterranean areas. In CIHEAM. IAM-B, Workshop on environmentally sound water management of protected agriculture under Mediterranean and arid climates, Bari, Italy, 16-18 July 1993. Bari, Italy: CIHEAM. pp.8.3-8.16.

*Drip irrigation / Plant protection / Evapotranspiration / Water requirements*

(Location: HQ Call No: 333.91 GG20 CIH Record No: H 13978)

**Abstract:** The soil water distribution patterns in each case must determine the emitter election (discharge rate) and the emitters density of the drip system, depending on the crop characteristics. A well-designed drip irrigation system must be properly managed (avoiding clogging) to preserve a high emission uniformity, in order to reach a good water use efficiency. The use of the class A evaporation pan is a simple and reliable method to quantify Evapotranspiration (ET) inside the greenhouse in Mediterranean areas. Tensiometers are practical for determining drip irrigation frequency.

14253. **Chauhan, C.P.S.; Singh, R.B. 1993.** Mustard performs well even with saline irrigation. *Indian Farming*, March:19-20.

*Irrigation water / Salinity / Plant growth*

(Location: HQ Call No: P 3251 Record No: H 13731)

14254. **Chawla, K.L.; Khosla, B.K. 1993.** Saline water can also be used for leaching. *Indian Farming*, 43(8):27-28.

*Salinity / Water quality / Leaching / Infiltration / India*

(Location: HQ Call No: P 3421 Record No: H 13906)

14255. **Chesness, J.L.; Cochran, D.L.; Hook, J.E. 1986.** Predicting seasonal irrigation water requirements on coarse-textured soils. In *American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water*, Vol.29. St. Joseph, MI, USA: ASAE. pp.1054-1057.

*Water balance / Water requirements / Soil texture / Rainfall-runoff relationships / Precipitation / Percolation / Soil water movement / Simulation models / USA*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13856)

14256. **Clark, A.K.; Aniq, M. 1993.** Canal irrigation and development opportunities for the Indus Right Bank in Sindh and Balochistan. *ICID Bulletin*, 42(1):11-32.

*Irrigation canals / Rice / Wheat / Salinity control / Cropping systems / Agricultural production / Water use efficiency / Water table / Pakistan / Sindh / Balochistan*

(Location: HQ Call No: PER Record No: H 13962)

14257. **Clothier, B.E.; Green, S.R. 1994.** Rootzone processes and the efficient use of irrigation water. Review article. *Agricultural Water Management*, 25(1):1-12.

*Sprinkler irrigation / Flood irrigation / Irrigation water / Water use efficiency / Infiltration / Irrigation effects*

(Location: HQ Call No: PER Record No: H 14062)

**Abstract:** The need for more-efficient agricultural use of irrigation water arises out of increased competition for water resources, and the greater pressure on irrigation practices to be environmentally friendly. In this review for the 25th Jubilee volume of *Agricultural Water Management* we focus on three rootzone processes that determine water-use efficiency in irrigation. Firstly, we discuss the role of macropores in preferentially-transporting irrigation water to depth during infiltration under both sprinkler and flood systems. It is suggested that more-uniform entry of irrigation water into the rootzone will result either by matching the sprinkler rate to the soil's matrix hydraulic conductivity, or by modifying the soil-surface's macroporosity prior to flood irrigation. Secondly, the environmentally-deleterious leaching of chemicals by irrigation is shown to be reduced if the applied fertilizer is first washed into dry soil by a small amount of water. This first pulse of water is drawn by capillarity

into the soil's microporosity, and it carries with it the dissolved fertilizer which becomes resident there. These nutrients are then available for plant uptake, yet less prone to subsequent leaching by heavy rains. Meanwhile, initially- resident solutes in the dry soil, such as salts, will be more-effectively displaced by the infiltrating irrigation water. Finally, our time domain reflectometry (TDR) observations of the changing soil water content in the rootzone of a kiwifruit vine, and our direct measurements of sap flow within individual roots, both reveal that plants can rapidly change their spatial pattern of water uptake in response to the application of irrigation water. The prime uptake role of near-surface roots is highlighted. Consideration of all three of these rootzone processes reinforces the claim that more-efficient and environmentally-sustainable water management will arise through higher-frequency applications of smaller amounts of irrigation.

14258. **Deckers, J.; Serneels, S.; Diallo, A.; Raes, D. 1992.** The fate of fossil saline soils under irrigated rice in the Senegal River delta. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management*, Leuven, Belgium, 14-17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.687-696.

*Soil salinity / Rice / Irrigated farming / Groundwater / Soil properties / Senegal*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14449)

14259. **Dhawan, B.D. 1994.** Reclamation of degraded lands within canal commands. *Economic and Political Weekly*, 29(40):2625-2630.

*Salinity / Waterlogging / Investment / Drainage / Land reclamation / Crop yield / Costs / India*

(Location: ODI Call No: ODI Journals Record No: L 942662)

14260. **Dukker, P.; Bhutta, M.N.; Roos, P.; Javed, I. 1994.** Seepage losses from the Lower Gugera Branch Canal, Punjab, Pakistan. Lahore, Pakistan: IWASRI. v. 86p. (Publication no.134 / NRAP report no.57)

*Seepage loss / Irrigation canals / Water loss / Tube wells / Groundwater / Data collection / Pakistan / Punjab*

(Location: HQ Call No: 631.7.2 G730 DUK Record No: H 15323)

14261. **El-Guindy, S.; Abu-Bakr, A. 1991.** The impact of saline water irrigation on soil and crop production under Egyptian conditions. In *ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991*. Vol.1-C: Ir-

rigation management. New Delhi, India: ICID. pp.168-177.

*Salinity / Water quality / Irrigation water / Drainage / Water reuse / Crop yield / Cotton / Rice / Barley / Wheat / Soil salinity / Egypt*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14925)

14262. **El-Haddad, E.S.H.M.; O'Leary, J.W. 1994.** Effect of salinity and K/Na ratio of irrigation water on growth and solute content of Atriplex amnicola and Sorghum bicolor. Irrigation Science, 14(3):127-133.

*Plant growth / Irrigation water / Salinity / Sorghum*  
(Location: HQ Call No: PER Record No: H 13987)

14263. **Eliades, G. 1993.** Irrigation of maize for grain production. Nicosia, Cyprus: Agricultural Research Institute. 6p. (Technical bulletin 152)

*Drip irrigation / Maize / Water requirements / Crop production*  
(Location: HQ Call No: P 3423 Record No: H 14523)

14264. **Fareed, M. 1992.** Irrigation-water management in tea. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.667-679.

*Water management / Water requirements / Irrigation management / Economic aspects / Soil moisture / Evapotranspiration / India / Georgia / Africa*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14447)

14265. **Fipps, G. 1993.** Melons demonstrate drip under plastic efficiency. Irrigation Journal, 43(7):8-12.

*Drip irrigation / Plastics / Furrow irrigation / Irrigation scheduling / Crop production / USA / Texas*  
(Location: HQ Call No: PER Record No: H 14084)

14266. **Fonteh, M.F.; Podmore, T. 1994.** Application of geostatistics to characterize spatial variability of infiltration in furrow irrigation. Agricultural Water Management, 25(2):153-165.

*Furrow irrigation / Infiltration / Computer techniques / Simulation models / Performance evaluation / Measurement / Soil properties / Irrigation efficiency*  
(Location: HQ Call No: PER Record No: H 14269)

14267. **Gadelle, F.; Fauchon, P. 1993.** Conception evolutive des aménagements rizicoles. [Evolutive design of a rice growing development scheme] In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.317-331.

*Rice / Crop yield / Crop production / Sudan / Mali*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15086)

14268. **Gelburd, D.E. 1985.** Managing salinity lessons from the past. Journal of Soil and Water Conservation, 40(4):329-331.

*Salinity control / Arid zones / Plant growth / Crop production / Water availability / History / Iraq / USA*  
(Location: HQ Call No: P 3371 Record No: H 14187)

14269. **Girdhar, I.K.; Singh, N.T.; Prasad, R. 1991.** Avoid rice-based cropping system if irrigation water is sodic. Indian Farming, 41(9):17-18.

*Sodic soils / Water quality / Groundwater / Irrigation requirements / Water requirements / Crop yield / Cropping systems / Rice / Wheat / Sorghum / Farmer participation / India / Haryana*  
(Location: HQ Call No: P 3586 Record No: H 15178)

14270. **Gonçalves, J.M.; Sousa, P.L.; Pereira, L.S. 1993.** Field evaluation of continuous and surge irrigation on furrows with different tillage practices. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.403-415.

*Surge irrigation / Furrow irrigation / Tillage / Evaluation / Simulation models / Portugal / Mondego Valley*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15092)

14271. **Grattan, S.R.; Royo, A.; Aragüés, R. 1994.** Chloride accumulation and partitioning in barley as affected by differential root and foliar salt absorption under saline sprinkler irrigation. Irrigation Science, 14(3):147-155.

*Soil salinity / Drip irrigation / Barley / Sprinkler irrigation / Plant growth*  
(Location: HQ Call No: PER Record No: H 13989)

14272. **Greenwood, E.A.N.; Biddiscombe, E.F.; Rogers, A.L.; Beresford, J.D.; Watson, G.D. 1994.** The influence on groundwater levels and salinity of a multi-specied tree plantation in the 500 mm rainfall region of south-western



Australia. *Agricultural Water Management*, 25(2):185-200.

*Groundwater / Salinity / Water table / Australia*  
(Location: HQ Call No: PER Record No: H 14272)

14273. **Grema, A.K.; Hess, T.M. 1994.** Water balance and water use of pearl millet-cowpea intercrops in north east Nigeria. *Agricultural Water Management*, 26(3):169-185.

*Water balance / Water use / Cropping systems / Soil water relations / Millets / Nigeria*  
(Location: HQ Call No: PER Record No: H 15665)

14274. **Gupta, S.K. 1993.** A case for subsurface drainage for sustainable agriculture in irrigated lands of India. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.77-88.

*Sustainability / Subsurface drainage / Agricultural production / Waterlogging / Salinity / Land reclamation / India*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15067)

14275. **Gutiérrez, E.; Arreguín, F.; Huerto, R.; Saldaña, P. 1994.** Aquatic weed control. *Water Resources Development*, 10(3):291-312.

*Aquatic weeds / Weed control / Chemical control / Biological control / Water quality / Dams / Mexico*  
(Location: HQ Call No: PER Record No: H 15472)

14276. **Hargreaves, G.H. 1994.** Defining and using reference evapotranspiration. *Journal of Irrigation and Drainage Engineering*, 120(6):1132-1139.

*Evapotranspiration / Water resource management / Lysimetry*  
(Location: HQ Call No: PER Record No: H 15687)

14277. **Hassan, R.; Faki, H.; Byerlee, D. 1994.** Improved wheat production practices and the question of economic efficiency in the Gezira Irrigation Scheme. In Saunders, D.A.; Hettel, G.P. (Eds.), *Wheat in heat-stressed environments: Irrigated, dry areas and rice-wheat farming systems: Proceedings of the International Conferences, Wheat in Hot, Dry, Irrigated Environments, Wad Medani, Sudan, 1-4 February 1993; Wheat in Warm Area, Rice-Wheat Farming Systems, Dinajpur, Bangladesh, 13-15 February 1993.* Mexico, DF, Mexico: CIMMYT. pp.78-95.

*Wheat / Cotton / Crop production / Economic aspects / Economic analysis / Pricing / Irrigation programs / Sudan*  
(Location: HQ Call No: 633.11 G000 SAU Record No: H 14813)

14278. **Herath, H.M.M.S.K. 1992.** Crop diversification for sustainable land use in Sri Lanka. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992.* Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.645-655.

*Crops / Diversification / Land use / Sustainability / Irrigation management / Constraints / Rice / Climate / Soils / Sri Lanka*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14445)

14279. **Hoogmoed, W.B.; Berkhout, J.A.A.; Stroosnijder, L. 1992.** Soil tillage options for water management under erratic-rainfall conditions. *Hommes Terre et Eaux*, 22(7):40-45.

*Soil management / Water conservation / Water management / Tillage / Rainfall-runoff relationships / Erosion / Infiltration / Evaporation / Simulation models / Millets / Crop production / Weed control / Soil water movement / West Africa / Sudan / Sahel*  
(Location: HQ Call No: P 3254 Record No: H 13732)

14280. **Hook, J.E. 1994.** Using crop models to plan water withdrawals for irrigation in drought years. *Agricultural Systems*, 45(3):271-289.

*Water requirements / Water management / Crop production / Irrigation water / Water use / Models / Drought / USA / Georgia*  
(Location: HQ Call No: PER Record No: H 14274)

**Abstract:** Knowledge of water demands during periods of severe drought is needed to develop strategies for water management. The potential (no-water stress) and the lowest (no irrigation) yields for corn, soybean and peanut were calculated using three crop growth and water use models - CERES-Maize, SOYGRO, and PNUTGRO. Rainfall, temperature, and solar radiation records were used with these models to identify the 15 most severe drought years in the 53 year record in a 36-county region of Georgia that contains almost 75% of Georgia's irrigated land. In the 15 driest years, simulated yield losses averaged 75% for corn, 73% for soybean, and 64% for peanut. Irrigation amount and timing needed to provide 90% of the no-stress yields were calculated. Most of the irrigation needs of corn in these drought years occurred before that of peanut or soybean. For the reported irrigated crop acreage of the study area, simulated water withdrawals exceeded 3 million m<sup>3</sup> per day, on the average, for most of the 130 days between late May and late

September. Further application of the techniques used here could lead to regional or watershed specific estimates of maximum water needs.

14281. **Howell, T.A.; Musick, J.T.; Tolk, J.A. 1986.** Canopy temperature of irrigated winter wheat. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.1692-1698;1706.

*Wheat / Irrigation water / USA*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13869)

14282. **Hulugalle, N.R.; Cooper, J. 1994.** Effects of crop rotation and residue management on properties of cracking clay soils under irrigated cotton-based farming systems of New South Wales. Land Degradation & Rehabilitation, 5(1):1-11.

*Crop rotation / Soils / Irrigated farming / Cotton / Farming systems / Australia / New South Wales*

(Location: ODI Call No: ODI Journals Record No: L 942187)

14283. **Hundertmark, W.; Widmoser, P. 1993.** Optimal cropping patterns under irrigation with salt leaching using linear programming. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.1-13.

*Cropping systems / Leaching / Salinity / Linear programming / Mathematical models / Tunisia*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15061)

14284. **Hussain, G.; Sadiq, M.; Nabulsi, Y.A.; Helweg, O.J. 1994.** Effect of saline water on establishment of windbreak trees. Agricultural Water Management, 25(1):35-43.

*Irrigation water / Soil salinity / Soil properties / Plant propagation*

(Location: HQ Call No: PER Record No: H 14064)

**Abstract:** A pot experiment was conducted to determine the effect of saline water on the establishment of windbreak trees and soil properties. Survival period of trees decreased significantly with increase in soil salinity resulted from irrigation water salinity. The survival period of *Prosopis juliflora* was significantly more than *Casuarina equisetifolia* and *Eucalyptus camaldulensis*. The decrease in total biomass yield was significant with increase in soil salinity. Soil salinity and sodicity increased significantly with an increase in irrigation water salinity and sodicity. *Prosopis juliflora* tolerated soil salinity (EC e) up to 38.3 dS.m<sup>-1</sup> with irrigation water salinity of 13.5 dS.m<sup>-1</sup>, *Casuarina equisetifolia* up to 27.6 dS.m<sup>-1</sup> with irrigation water salinity of 6.6 dS.m<sup>-1</sup> and *Eucalyptus camaldulensis* up to 15.2 dS.m<sup>-1</sup>

with irrigation water salinity of 2.12 dS.m<sup>-1</sup> for proper establishment provided 15% excess water is applied as leaching requirement to control soil salinity. The experiment proved the sequence in salt tolerance for different trees as *prosopis casuarina eucalyptus*. The results suggested that *prosopis juliflora* should be cultivated as windbreak trees in landscape and sand stabilization projects.

14285. **Hutmacher, R.B.; Nightingale, H.I.; Rolston, D.E.; Biggar, J.W.; Dale, F.; Vail, S. S.; Peters, D. 1994.** Growth and yield responses of almond (*prunus amygdalus*) to trickle irrigation. Irrigation Science, 14(3):117-126.

*Plant growth / Crop yield / Drip irrigation / Water requirements / USA / California*

(Location: HQ Call No: PER Record No: H 13986)

14286. **Ishag, H.M. 1994.** Genotype differences in heat stress in wheat in the irrigated Gezira Scheme. In Saunders, D.A.; Hettel, G.P. (Eds.), Wheat in heat-stressed environments. Irrigated, dry areas and rice-wheat farming systems: Proceedings of the International Conferences. Mexico, DF, Mexico: CIMMYT. pp.170-174.

*Wheat / Crop production / Crop yield / Irrigation programs / Sudan*

(Location: HQ Call No: 633.11 G000 SAU Record No: H 14814)

14287. **Jadhao, S.L.; Keskar, P.B.; Turkhede, A.B.; Shinde, V.U. 1992.** Studies on irrigation and phosphorus requirement of Berseem (*Trifolium alexandrinum* L.) PKV Research Journal, 16(1):54-56.

*Crop yield / Fodder / Irrigation scheduling / Soil-water-plant relationships / Water use efficiency / Field tests / India*

(Location: HQ Call No: P 3323 Record No: H 14005)

14288. **Johnson, N. 1993.** New Mexico chili farmers stuff phytophthora. Irrigation Journal, 43(7):14-16.

*Irrigated farming / Plant diseases / Chillies / Vegetables / Irrigation practices / Furrow irrigation / USA / New Mexico*

(Location: HQ Call No: PER Record No: H 14085)

14289. **Joshi, P.K.; Tyagi, N.K. 1994.** Extent of salt affected and water-logged soils in India. Research study (draft) of an ICAR-IFPRI Collaborative Project, April 1994. 14p.

*Soil salinity / Waterlogging / Alkaline soils / India*

(Location: HQ Call No: P 3493 Record No: H 14635)

14290. **Joshi, P.K.; Jha, D. 1991.** Farm-level effects of soil degradation in Sharda Sahayak Irrigation Project. Washington, DC, USA: IFPRI. 52p. (Working papers on future growth in Indian agriculture, no.1)

*Soil degradation / Irrigation programs / Farm income / Salinity / Waterlogging / India*  
(Location: HQ Call No: P 3417 Record No: H 14310)

14291. Joshi, P.K.; Tyagi, N.K.; Svendsen, M. 1994. Measuring crop damage due to soil salinity. Research study (draft) of an ICAR-IFPRI Collaborative Project, April 1994. 16p.

*Soil salinity / Crop yield / Statistical analysis / India / Haryana*  
(Location: HQ Call No: IIMI 631.7.2 G000 JOS Record No: H 14636)

14292. Joshi, P.K.; Tyagi, N.K.; Svendsen, M. 1994. Salinity development and farmers' management strategies. Research study of an ICAR-IFPRI Collaborative Project, April 1994. 3p.

*Soil salinity / Waterlogging / Farmers' attitudes / Farmer participation / Farm management / India / Haryana*  
(Location: HQ Call No: IIMI 631.7.2 G000 JOS Record No: H 14634)

14293. Kaida, Y. 1991. Irrigation landscapes and waterscapes in the rice land of tropical Asia. Southeast Asian Studies, 28(4):124-135.

*Rice / Irrigated sites / Tank irrigation / Tube well irrigation / Rain-fed farming / Asia*  
(Location: HQ Call No: P 3390 Record No: H 14206)

14294. Kanwar, R.S.; Melvin, S.W.; Kalita, P.K. 1993. Dual-pipe subirrigation system for productivity and water quality benefits. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1017-1031.

*Irrigation systems / Pipes / Subsurface irrigation / Soil water relations / Water quality / Groundwater / Water table / Performance evaluation*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15335)

14295. Katerji, N.; van Hoorn, J.W.; Hamdy, A.; Karam, F.; Mastrorilli, M. 1994. Effect of salinity on emergence and on water stress and early seedling growth of sunflower and maize. Agricultural Water Management, 26(1/2):81-91.

*Soil salinity / Plant growth / Water stress / Sunflowers / Maize / Evapotranspiration / Italy*  
(Location: HQ Call No: PER Record No: H 15481)

14296. Katyal, J.C.; Venkateswarlu, B. 1993. Management of water resources in rainfed areas of India - The critical issues. ICID Bulletin, 42(2):1-9.

*Water resources development / Water harvesting / Watershed management / Groundwater / Crop*

*production / Rain-fed farming / Water use efficiency / Arid lands / Water policy / India*  
(Location: HQ Call No: PER Record No: H 14494)

14297. Keita, A.; Sally, H. (Eds.) 1994. Session de formation des agriculteurs du périmètre irrigué de Gorgo, 23-27 Mai 1994. [Training session for farmers of Gorgo irrigation scheme, IIMI, Ouagadougou, Burkina Faso, 23-27 May 1994] Unpublished report of a training session for 212 farmers of Gorgo irrigation scheme, IIMI, Ouagadougou, Burkina Faso, November 1994. 81p.

*Irrigation management / Rice / Farmer participation / Agricultural production / Training / Drainage / Reservoirs / Burkina Faso*  
(Location: HQ Call No: IIMI 631.7.2 G226 KEI Record No: H 15712)

14298. Klocke, N.L.; Schneekloth, J.P.; Hergert, G.W.; Clark, R.T. 1992. Irrigation and crop management to sustain an aquifer. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.419-428.

*Cropping systems / Irrigation practices / Crop yield / Evapotranspiration / Economic aspects / Water use / USA / Nebraska*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14370)

**Abstract:** A field study has been conducted for the past 10 years to compare a crop rotation of winter wheat (*Triticum aestivum* L.) - corn (*Zea mays* L.) - Soybean [*Glycine max* (L.)] (W-C-S-) with continuous corn (CC) in the semi-arid climate of west central Nebraska. These crop rotations have been grown with dryland, limited irrigation (150 mm yr), and full irrigation (evapotranspiration demand with maximum 50% soil water depletion) water management system under conservation tillage on a Cozad silt loam (Fluventic Haplustoll) soil. The effects of the cropping systems on crop yield, water use, soil water storage, and economic return have been evaluated.

14299. Koluvek, P.K.; Tanji, K.K.; Trout, T.J. 1993. Overview of soil erosion from irrigation. Journal of Irrigation and Drainage Engineering, 119(6):929-946.

*Erosion / Irrigated sites / Sedimentation / USA / Idaho*  
(Location: HQ Call No: PER Record No: H 13669)

**Abstract:** Of the 15,000,000 ha (37,000,000 acres) of irrigated land in the U.S., 21% is affected by soil erosion to some extent. Irrigation-induced soil erosion has been studied, primarily in the

Northwestern United States, since 1940. A number of studies have measured annual sediment yields from furrow-irrigated fields exceeding 20 t/ha (9 tons/acre) with some fields exceeding 100 t/ha (45 tons/acre). Under the center-pivot sprinkler method, sediment yields as high as 33 t/ha (15 tons/acre) have been measured. Annual sediment yields as high as 4.5 t/ha (2 tons/acre) were measured from irrigation tracts. Erosion is seldom excessive on slopes less than 1% and is often excessive on slopes greater than 2%. Erosion reduces the agricultural productivity of the fields and causes off-farm damages. In southern Idaho, crop yield potential has been reduced by 25% due to 80 years of irrigation-induced erosion. Some irrigation districts spend more than \$50,000 annually to remove sediment from drains. Sediment in irrigation return flows causes major water-quality degradation problems in several rivers in the Western US.

14300. **Kuroda, M.; Fukuda, T.; Nurrochmad, F. 1993.** Irrigation return flow mechanism and water quality in creek system of low lying paddy area. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1179-1190.

*Rice / Paddy fields / Water quality / Water use efficiency / Water reuse / Irrigation water / Water conservation / Drainage / Models / Water balance / Monitoring / Japan*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15348)

14301. **Kuroda, M.; Nakano, Y. 1993.** Salts and soil water interactions in greenhouse culture. ICID Bulletin, 42(2):73-89.

*Soil water / Soil salinity / Plant growth / Evapotranspiration / Leaching / Fertilizers / Japan*  
(Location: HQ Call No: PER Record No: H 14500)

**Abstract:** Salt accumulation in cultivated soils usually do not occur in natural conditions of high humidity and rainfall. However, salt has appeared in crops grown under greenhouse culture, which has become a major problem in Japan. The injuries in greenhouse are mostly caused by increasing of salt concentrations in soils due to intensive application of chemical fertilizers and the lack of adequate salt leaching. Greenhouse culture prevents the natural rainfall leaching. This paper summarizes research on salt accumulation in greenhouse culture between 1979 to 1989 in Japan, describes plant physiological, chemical, physical, and management approaches to solving salt accumulation problems, and discusses general

procedures for selection and design of micro irrigation systems.

14302. **Labhsetwar, V.K.; Varade, S.B. 1991.** A case study: Post irrigation soil survey of Nira Project for water management. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.234-248.

*Soil surveys / Soil properties / Soil salinity / Soil fertility / Water management / Case studies / India / Maharashtra*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14930)

14303. **Lamacq, S.; Wallender, W.W. 1994.** Soil water model for evaluating water delivery flexibility. Journal of Irrigation and Drainage Engineering, 120(4):756-774.

*Soil water relations / Water delivery / Simulation models / Evapotranspiration / Percolation / Furrow irrigation / Irrigation scheduling / Water allocation / USA / California*

(Location: HQ Call No: PER Record No: H 14965)

14304. **Lankford, B.A. 1992.** Growth patterns of sugarcane associated with dragline sprinkler irrigation on a commercial estate in Swaziland. Irrigation News, No.21 Autumn:71-76.

*Sprinkler irrigation / Sugarcane / Crop production / Swaziland*

(Location: ODI Call No: ODI Journals Record No: L 942413)

14305. **Le Bars, Y.; Rieul, L. 1993.** L'eau et l'agriculture en France: Reflexions d'un groupe national de travail pour une meilleure gestion de l'eau a usage agricole. [Water and agriculture in France: Considerations of a working group for better agricultural water management] In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-G, Special session - Irrigation and drainage in competition for water. New Delhi, India: ICID. pp.87-105.

*Irrigation water / Irrigated farming / Water management / Drought / Water conservation / Water conveyance / Agricultural production / France*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15723)

14306. **Le Quang, M.; Nguyen, T.C.; Tuong, P. 1992.** Basin-cum-furrow irrigation technique for post-rice upland crop on heavy clay soil ricelands of Mekong Delta, Vietnam. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven,

Belgium, 14-17 September 1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.395-407.

*Furrow irrigation / Basin irrigation / Clay soils / Rice / River basins / Farmers' attitudes / Economic analysis / Performance indexes / Vietnam / Mekong River*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14368)

**Abstract:** Flat topography, heavy clay soil with low permeability and cracks resulting in high water loss as well as waterlogging after sudden heavy showers hinder farmers' acceptance to basin irrigation for post-rice upland crop. Conventional furrow irrigation technique was not practiced because of high input for land shaping. A new irrigation technique was tested in which water was distributed by furrows at 5 and 10 meters spacings, allowed to overlap the furrows and to flow overland while being infiltrated both horizontally and vertically into root zone. The furrows also removed excess water. Factors affecting the technique including furrow spacings, irrigation frequency, mulching and land preparation were also tested. Economic performance indicators at farm level and farmers' acceptance were analyzed.

14307. **Lehrsch, G.A.; Whisler, F.D.; Buchring, N.W. 1994.** Cropping system influences on extractable water for mono - and double-cropped soybean. *Agricultural Water Management*, 26(1/2):13-25.

*Water requirements / Cropping systems / Plant growth / Wheat / Soyabeans / USA*

(Location: HQ Call No: PER Record No: H 15476)

14308. **Liu, Z.Y.; He, G.; Croon, F.W. 1991.** Soil salinity with and without subsurface drainage in Xinjiang autonomous region, China. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.204-219.

*Soil salinity / Subsurface drainage / Rice / Cotton / China*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14928)

14309. **Loane, B. 1992.** Linking science and economics for policy advice: Case-study of trees for salinity control. *Review of Marketing and Agricultural Economics*, 60(2):269-276.

*Salinity control / Computer models / Simulation / Economic policy / Cost benefit analysis / Economic aspects / Australia / Victoria*

(Location: HQ Call No: P 3645 Record No: H 15536)

14310. **Lou, H. 1991.** Irrigation and drainage management of waterlogged paddy field in the Pearl River Delta. In ICID, The Special Technical Session: Proceedings, Bei-

jing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.249-256.

*Rice / Paddy fields / Waterlogging / Drainage / Water management / China*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14931)

14311. **Louzada, J.A.S.; Dorfman, R.; Beltrame, L.F.S. 1993.** Relationship between subsurface drainage and yield in irrigated rice. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1297-1304.

*Rice / Crop yield / Subsurface drainage / Economic analysis / Brazil*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15355)

14312. **Madramootoo, C.A.; Dodds, G.T.; Papadopoulos, A. 1993.** Agronomic and environmental benefits of water-table management. *Journal of Irrigation and Drainage Engineering*, 119(6):1052-1065.

*Agronomy / Environmental effects / Water table / Crop yield / Soyabeans / Soil moisture / Soil properties / Canada / Quebec*

(Location: HQ Call No: PER Record No: H 13677)

14313. **Madramootoo, C.A.; Rigby, M.; MacKenzie, A.F.; Stewart, K.A. 1993.** Yield response of bell peppers to four irrigation levels and three nitrogen fertilizer rates in a humid climate. *ICID Bulletin*, 42(1):63-72.

*Yield response functions / Water requirements / Irrigation water / Nitrogen / Fertilizers / Vegetables / Climate / Canada / Quebec*

(Location: HQ Call No: PER Record No: H 13965)

**Abstract:** A two-year field study was conducted in southern Quebec to determine the response of bell peppers (*Capsicum annuum* L.) to four water application rates factorially combined with three nitrogen fertilizer rates. Marketable pepper yield increased with water applied, regardless of fertilizer rate. There was no significant increase in yield due to nitrogen fertilizer. It appeared that the minimum nitrogen fertilizer rates of 22.5 kg/ha applied in July and 11.25 kg/ha applied in August, as well as the preplant rate of 80 kg/ha, were sufficient for maximum yield. The irrigation water probably ensured that nitrogen was readily available for plant uptake. Production functions of yield vs. total water applied were plotted.

14314. **Manchanda, H.R.; Sharma, S.K.; Mor, R.P.; Roest, C.W.J. 1993.** Relative efficacy of the reuse of saline drainage water dominated by chloride and sulphate ions. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water

management in the next century: Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1409-1418.

*Water quality / Salinity / Water reuse / Irrigation water / Soil properties / Crop yield / India*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15485)

14315. **Mandavia, A.B.; Joshi, M.B. 1994.** Irrigation timing for wheat based on climate, crop, and soil data. Journal of Irrigation and Drainage Engineering, 120(5):988-989.

*Wheat / Soil moisture / Soil water relations / Water table / Rain / Irrigation requirements*  
(Location: HQ Call No: PER Record No: H 15379)

14316. **Maticic, B.; Avbelj, L.; Feges, M. 1992.** The potential impact of irrigation/drainage and nitrogen fertilization on environmentally sound and antitoxic food production. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 1. Leuven, Belgium: Center for Irrigation Engineering. pp.203-213.

*Irrigation effects / Drainage / Fertilizers / Food production / Vegetables*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14350)

**Abstract:** The influence of irrigation and nitrogen fertilization on the yield and the nitrate and nitrite content in vegetables was observed in an experiment at the Agrohydrological station of the Biotechnical Faculty, Ljubljana, Yugoslavia during 1985-1990. The objectives of the study were to determine the effects of soil moisture and nitrogen fertilizer applications for maximum vegetable production with appropriate levels of nitrate and nitrite content in the plant tissues. Vegetables of cabbage, garden beet, celery, chicory and lettuce were grown in 72 lysimeters. Plants were treated with four nitrogen levels and six water application levels in three replications. Both irrigation and nitrogen fertilization significantly influenced the nitrate and nitrite content in fresh cabbage and celery samples. The  $\text{NO}_2$  and  $\text{NO}_3$  content in plants increased significantly if plants were under water stress with either too little or too much water in the soil. To produce healthy vegetables with no toxic levels of nitrogen substances, the proper maintenance of water content in the soil within an optimum range is necessary by both drainage and irrigation as required.

14317. **Mechlia, N.B.; Masmoudi, M.M. 1993.** The process of evapotranspiration under plastic greenhouses. In CIHEAM. IAM-B, Workshop on environmentally sound water management of protected agriculture under Mediterranean and arid climates, Bari, Italy, 16-18 July 1993. Bari, Italy: CIHEAM. pp.5.3-5.11.

*Evapotranspiration / Water requirements / Plant protection / Soil-water-plant relationships*  
(Location: HQ Call No: 333.91 GG20 CIH Record No: H 13976)

14318. **Menenti, M. 1992.** Appraisal and optimization of agricultural water use in large irrigation schemes-I. Theory. Water Resources Management, 6(3):185-199.

*Water use / Irrigated farming / Water supply / Mathematical models / Irrigation systems*  
(Location: ODI Call No: ODI Journals Record No: L 942458)

14319. **Menenti, M. 1992.** Appraisal and optimization of agricultural water use in large irrigation schemes-II. Applications. Water Resources Management, 6(3):201-221.

*Groundwater / Water use / Surface water / Argentina / Rio Mendoza / Rio Tunuyan / Mendoza*  
(Location: ODI Call No: ODI Journals Record No: L 942459)

14320. **Milly, P.C.D. 1994.** Climate, interseasonal storage of soil water, and the annual water balance. Advances in Water Resources, 17(1-2):19-24.

*Soil moisture / Soil water relations / Water balance / Precipitation / Evaporation / Infiltration / Models / Hydrology / USA*  
(Location: HQ Call No: PER Record No: H 15113)

14321. **Minhas, P.S.; Naresh, R.K.; Chauhan, C.P.S.; Gupta, R.K. 1994.** Field determined hydraulic properties of a sandy loam soil irrigated with various salinity and SAR waters. Agricultural Water Management, 25(2):97-108.

*Salinity / Sandy soils / Irrigation effects / Hydraulics / Soil water relations / Water quality*  
(Location: HQ Call No: PER Record No: H 14265)

14322. **Mohamoud, Y.M. 1994.** Effect of mound height and cassava cultivar on cassava performance under a fluctuating water table. Agricultural Water Management, 26(3):201-211.

*Water table / Cassava / Crop yield / Soil moisture / Nigeria*  
(Location: HQ Call No: PER Record No: H 15667)

14323. **Mohan, S.; Arumugam, N. 1994.** Crop coefficients of major crops in South India. Agricultural Water Management, 26(1/2):67-80.

*Water requirements / Irrigation requirements / Evapotranspiration / Regression analysis / Cotton*

*/ Sorghum / Millets / Models / India / Tamil Nadu / Karnataka*

(Location: HQ Call No: PER Record No: H 15480)

14324. Mohanty, B.P.; Tim, U.S.; Anderson, C.E.; Woestman, T. 1994. Impacts of agricultural drainage well closure on crop production: A watershed case study. *Water Resources Bulletin*, 30(4):687-703.

*Watershed management / Case studies / Wells / GIS / Drainage / Groundwater / Models / Crop yield / USA / Iowa*

(Location: HQ Call No: PER Record No: H 15677)

14325. Mwendera, E.J.; Feyen, J. 1992. Dynamic irrigation scheduling on freshly tilled soils. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.815-824.*

*Irrigation scheduling / Soils / Rain / Infiltration / Simulation models / Regression analysis*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14463)

14326. Myer, G.L.; Miller, W.W.; Zheng, Y. 1993. Water management for profit maximization. *Journal of Production Agriculture*, 6(4):542-545.

*Water allocation / Water management / Soil moisture / Irrigation scheduling / Models / Crop yield*

(Location: HQ Call No: P 3547 Record No: H 14785)

14327. Narang, R.S.; Gill, M.S. 1994. Water management constraints in rice-wheat rotations in India. In Saunders, D.A.; Hettel, G.P. (Eds.), *Wheat in heat-stressed environments: Irrigated, dry areas and rice-wheat farming systems: Proceedings of the International Conferences, Wheat in Hot, Dry, Irrigated Environments, Wad Medani, Sudan, 1-4 February 1993; Wheat in Warm Area, Rice-Wheat Farming Systems, Dinajpur, Bangladesh, 13-15 February 1993. Mexico, DF, Mexico: CIMMYT. pp.328-338.*

*Water management / Rice / Wheat / Cropping systems / Groundwater / Water policy / Water table / Water demand / Evapotranspiration / Water use efficiency / Irrigation practices / India / Punjab*

(Location: HQ Call No: 633.11 G000 SAU Record No: H 14815)

14328. Nathan, R.; Spieler, G. 1994. Wetting effects in citrus. *Far Eastern Agriculture*, May/June:17,20.

*Citrus fruits / Horticulture / Drip irrigation / USA / Florida*

(Location: HQ Call No: P 3596 Record No: H 15283)

14329. Nayyar, V.K.; Chhibba, I.M.; Bajwa, M.S. 1993. Management of zinc deficiency in sodic soils. *Indian Farming*, 43(8):6-8.

*Soil management / Sodic soils / Soil fertility / Minerals / Crop yield*

(Location: HQ Call No: P 3421 Record No: H 13904)

14330. Neshkova, M.; Chehlarova, S. 1993. Experience of irrigation with minimum water and soil losses in Bulgaria. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: *Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.807-813.*

*Water loss / Soils / Erosion / Irrigation effects / Sprinkler irrigation / Bulgaria*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15247)

14331. Ogino, Y.; Murashima, K. 1993. Subsurface drainage system of large size paddies for crop diversification in Japan. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: *Water management in the next century: Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1461-1468.*

*Drainage / Rice / Paddy fields / Crops / Diversification / Irrigated farming / Subsurface irrigation / Japan*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15490)

14332. Ong, C.K.; Khan, A.A.H. 1993. The direct measurement of water uptake by individual tree roots. *Agroforestry Today*, 5(4):2-5.

*Water requirements / Plant growth / Soil-water-plant relationships*

(Location: HQ Call No: P 3374 Record No: H 14190)

14333. Oron, G. 1994. Duckweed culture for wastewater renovation and biomass production. *Agricultural Water Management*, 26(1/2):27-40.

*Waste waters / Water reuse / Weed control / Aquatic weeds / Economic analysis*

(Location: HQ Call No: PER Record No: H 15477)

14334. Orphanos, P.I. 1993. Irrigation and NP fertilizing of phaseolus beans. Nicosia, Cyprus Agricultural Research Institute. 17p. (Technical bulletin 154)

*Beans (phaseolus) / Fertilizers / Drip irrigation / Water requirements / Water stress / Nitrogen / Cyprus*

(Location: HQ Call No: P 3424 Record No: H 14524)

14335. **Ouattara, A.; Sally, H.; Wetta, J.C. 1994.** Analyse de la consommation du riz et de la compétitivité de la riziculture domestique au Burkina Faso. [Analysis of rice consumption and the competitiveness of the irrigated rice production in Burkina Faso]: Bulletin du Réseau Irrigation Afrique de l'Ouest, No.4:26-30.

*Rice / Crop production / Agricultural production / Burkina Faso*

(Location: HQ Call No: PER Record No: H 14580)

14336. **Pal, D. 1991.** Determining critical water table depth for sub-surface drainage design and crop growth. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.178-191.

*Water table / Subsurface drainage / Plant growth / Crops / Salinity control*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14926)

14337. **Patel, C.L.; Bhatt, A. 1993.** Effluent irrigation in relation to nitrogen loading and cropping pattern. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century: Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1419-1428.

*Irrigation scheduling / Effluents / Water quality / Hydraulics / Nitrogen / Crop production / Crop yield / India / Gujarat*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15486)

14338. **Patil, S.M.; Morey, D.K. 1992.** Conservation of water through land surface modification and use of antitranspirants in cotton. PKV Research Journal, 16(2):180-184.

*Water conservation / Water use / Cotton / India*

(Location: HQ Call No: P 3325 Record No: H 14008)

14339. **Patil, V.K.; Chougule, A.A. 1993.** Drip irrigation - Indian scenario. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.15-32.

*Drip irrigation / Water use / Crop production / Horticulture / Vegetables / Cost benefit analysis / India*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15062)

14340. **Philis, I. 1993.** Use of nematicides through sprinkler irrigation to control the citrus nematode in established lemon trees. Nicosia, Cyprus Agricultural Research Institute. 6p. (Miscellaneous reports 59)

*Sprinkler irrigation / Pests / Citrus fruits*

(Location: HQ Call No: P 3422 Record No: H 14522)

14341. **Prasad, L.R.; Rao, M.S.; Raju, A.P.; Reddy, P.V. 1991.** Spatial variability of soil moisture characteristics of Maheswaram Watershed Area. The Journal of Research APAU, 19(3):132-137.

*Soil moisture / Watershed management / India / Andhra Pradesh*

(Location: HQ Call No: P 3373 Record No: H 14189)

14342. **Qureshi, Z.A.; Willardson, L.S. 1994.** Reducing risk of crop failure by using micro-catchment water harvesting in arid areas. ICID Bulletin, 43(1):13-22.

*Water harvesting / Crop yield / Arid zones / Soil moisture / Pakistan / Balochistan*

(Location: HQ Call No: PER Record No: H 15638)

14343. **Raes, D.; Sy, B.; Van Passel, L. 1992.** The water balance of rice irrigation schemes in the Senegal River Delta. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.835-844.

*Water balance / Rice / Water management / Water requirements / Irrigation programs / Evapotranspiration / Senegal*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14465)

14344. **Ragwen, M.R. 1993.** The impact of irrigation management water levels on rice yields-Aceh. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.283-297.

*Irrigation management / Water use / Rice / Crop yield / Paddy fields / Indonesia / Aceh*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15084)

14345. **Rajput, G.S. 1993.** Irrigation management through use of crop yield functions based on pan evaporation concept. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions:



Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.33-42.

*Irrigation management / Water allocation / Evapotranspiration / Crop yield / Irrigation scheduling*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15063)

14346. **Rasheed, M.A.; Kohl, W.P.; Sial, B.A. 1993.** Subsurface drainage for Fordwah Eastern Sadiqia to provide subirrigation with flexibility in operation. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century: Transactions: Vol.1-D, Question 44, R104-R118: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1469-1484.

*Subsurface drainage / Models / Irrigation programs / Waterlogging / Salinity / Water table / Crop production / Water requirements / Groundwater irrigation / Pakistan*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15491)

14347. **Reichman, G.A.; Doering, E.J.; Benz, L.C. 1986.** Water management effects on N-Use by corn and sugarbeets. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.198-202.

*Field tests / Surface irrigation / Water table / Water management / Maize / Crop yield / Fertilizers / Nitrogen / Field tests / USA / Dakota*  
(Location: HQ Call No: 631.4 G000 AME Record No: H 4862)

14348. **Rengasamy, P.; Olsson, K.A. 1993.** Irrigation and sodicity. Australian Journal of Soil Research, 31:821-837.

*Sodic soils / Soil management / Irrigated soils / Irrigation water / Groundwater / Australia*  
(Location: HQ Call No: P 3377 Record No: H 14193)

**Abstract:** The productivity of irrigated agriculture in Australia is low for most crops and one important factor is the physical and chemical constraints caused by sodicity in the rootzone. Over 80% of the irrigated soils are sodic and have degraded structure limiting water and gas transport and root growth. Irrigation, without appropriate drainage, leads to the buildup of salts in soil solutions with increased sodium absorption ratio (SAR) and can develop perched watertables due to a very low leaching fraction of the soil layers exacerbated by sodicity. Therefore, irrigation management in Australia is closely linked with the management of soil sodicity. The inevitable consequence of continued irrigation of crops and pastures with saline-sodic water without careful management is the further sodification of soil layers and concentration of salt in the rootzone. This will increase the possibility of dissolving

toxic elements from soil minerals. The yields of crops can be far below the potential yields determined by climate. The cost of continued use of amendments and fertilizers to maintain normal yields will increase under saline-sodic irrigation. Most of the irrigated soils in Australia need reclamation of sodicity of soil layers at least in the rootzone. The management of these sodic soils involves the application of gypsum, suitable tillage and the maintenance of structure by the buildup of organic matter and biological activity over time. The artificial drainage, an essential component of the management of irrigated sodic soils, is possible. By following these soil management practices, irrigated agriculture in Australia will become sustainable with increased yields and high economic returns.

14349. **Rodriguez-Iturbe, I. 1994.** Analytical framework for the characterization of the space-time variability of soil moisture. Advances in Water Resources, 17(1-2):35-45.

*Soil moisture / Hydrology / Rainfall-runoff relationships / Mathematical models / Water balance / Soil water relations*

(Location: HQ Call No: PER Record No: H 15115)

14350. **Sadler, E.J.; Camp, C.R. 1986.** Crop water use data available from the Southeastern USA. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.1070-1079.

*Water use / Field crops / Lysimetry / Evapotranspiration / Soils / Simulation / USA*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13858)

14351. **Saggu, S.S.; Kaushal, M.P. 1993.** Drip irrigation is better than furrow irrigation for potato crop. Indian Farming, December:11-12.

*Drip irrigation / Furrow irrigation / Potatoes / Crop production / India*

(Location: HQ Call No: P 3370 Record No: H 14186)

14352. **Saksena, K.K. 1991.** Irrigation management: Crop oriented approach. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.119-133.

*Irrigation management / Performance evaluation / Water use efficiency / Crop-based irrigation / Equity / Soil moisture / Soil-water-plant relationships / Irrigation scheduling / Computer techniques*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14921)

14353. **Saleh, A.F.M. 1991.** Supplementary irrigation in Bangladesh: Requirements, benefits and prospects. In

ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. pp.96-105.

*Supplementary irrigation / Irrigation requirements / Rice / Bangladesh*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14892)

14354. **Satpute, G.U.; Murali, K.; Pawade, M.N.; Ingle, P.O. 1992.** Difficulties faced by the users of drip irrigation system. PKV Research Journal, 16(2):259-260.

*Water use efficiency / Irrigation efficiency / Drip irrigation / India / Maharashtra*

(Location: HQ Call No: P 3326 Record No: H 14009)

14355. **Satpute, G.U.; Nikhade, P.D.; Dane, A.T. 1992.** Effect of dripper discharge rate and volume on soil moisture distribution pattern. PKV Research Journal, 16(1):88-92.

*Drip irrigation / Soil moisture / India*

(Location: HQ Call No: P 3302 Record No: H 13924)

14356. **Satpute, G.U.; Bendale, S.K.; Kausal, A.R. 1992.** Water requirement of tomato crop under drip and furrow irrigation. PKV Research Journal, 16(1):83-87.

*Water requirements / Drip irrigation / Furrow irrigation / Vegetables*

(Location: HQ Call No: P 3302 Record No: H 13923)

14357. **Scott, M.B.; Brutsch, M.O. 1994.** Evaluation of the trench-bed method of vegetable growing in semi-arid areas. Development Southern Africa, 11(2):253-257.

*Vegetables / Irrigation / Cabbages*

(Location: ODI Call No: ODI Journals Record No: L 942003)

14358. **Sepaskhah, A.R.; Kashefipour, S.M. 1994.** Relationships between leaf water potential, CWSI, yield and fruit quality of sweet lime under drip irrigation. Agricultural Water Management, 25(1):13-21.

*Drip irrigation / Water stress / Yield*

(Location: HQ Call No: PER Record No: H 14063)

**Abstract:** This study was initiated to correlate the leaf water potential and crop water stress index (CWSI) with the yield and yield quality of sweet lime (*Citrus limetta*, Swing) under drip irrigation with water application based on different fractions of pan evaporation (0.4 E pan to 1.0 E pan). The lower baseline for CWSI of Idso et al. (1901) was  $(T_c - T_a) = 3.61 - 1.74(VPD)$ , and the upper limit for CWSI calculations was 5.0 C. The average CWSI during the growing season varied from zero to 0.435 at different irrigation treatments (1.0 E pan to 0.4 E pan). The maximum fruit yield was produced at a pan evaporation fraction of 0.75, corresponding to the CWSI of 0.103 and leaf water

potential of - 2.03 MPa with maximum water-use efficiency of 26.8 kg/mm. However, the maximum weight of fruit, pulp and juice resulted at higher water application while the total dissolved solid, ascorbic acid and vitamin C were lower. The relationship between the leaf water potential and CWSI was dependent on the air vapor pressure deficit (VPD). Furthermore, a relationship between  $(T_c - T_a)$  and VPD was proposed for irrigation scheduling of sweet lime with an infrared thermometer method.

14359. **Serrano, J.G. 1991.** Integrated regulation of water resources for irrigation systems: Interconnection with aquifers. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.315-324.

*Water use efficiency / Pumping / Aquifers / Irrigation scheduling / Water conveyance / Water distribution / Spain*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14748)

14360. **Shaozhong, K.; Minggang, Z. 1992.** Crop water production function and optimal allocation of irrigation water use. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.801-807.

*Crop yield / Water allocation / Irrigation water / Water use / Wheat / Maize / Cotton / Water deficit / Evapotranspiration / Mathematical models / China*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14461)

14361. **Shaozhong, K.; Yunzhang, X. 1991.** Research on the diagnostic method of crop water stress and irrigation indicator. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. pp.162-169.

*Water stress / Soil-water-plant relationships / Water requirements / Wheat / Plant growth / Crop yield / Water balance / Irrigated farming / China*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14898)

14362. **Sharif, M.; Gill, M.A.; Bukhari, S.N.H. 1994.** Effect of irrigation water management on nitrogen leaching beyond root zone and ground-water contamination. In Awan, N.M.; Latif, M. (Comp.), Environmental assessment and management of irrigation and drainage projects for sustained agricultural growth: Proceedings of the International Symposium held at Centre of Excellence in Water Resources Engineering, University of Engineering and

Technology, Lahore, Pakistan, 24-28 October 1993. Vol.1. pp.101-124.

*Irrigation management / Nitrogen / Leaching / Irrigation scheduling / Groundwater / Water pollution / Irrigation effects / Potatoes / Crop yield*  
(Location: HQ Call No: 631.7.5 G730 AWA Record No: H 15401)

14363. Sharma, D.P.; Rao, K.V.G.K.; Singh, K.N.; Kumbhare, P.S.; Oosterbaan, R.J. 1994. Conjunctive use of saline and non-saline irrigation waters in semi-arid regions. *Irrigation Science*, 15(1):25-33.

*Arid zones / Conjunctive use / Irrigation water / Water quality / Surface drainage / Water reuse / Crop yield / Soil salinity / Sodic soils / India*  
(Location: HQ Call No: PER Record No: H 15385)

14364. Sharma, D.P.; Rao, K.V.G.K.; Singh, K.N.; Kumbhare, P.S. 1993. Management of subsurface saline drainage water. *Indian Farming*, 43(8):15-19.

*Subsurface drainage / Salinity / Water management / Irrigation water / Crop yield / India*  
(Location: HQ Call No: P 3421 Record No: H 13905)

14365. Shibo, H.; Sicong, Z.; Senchuan, X. 1993. Agricultural water resources and water saving irrigation field experiment in Beijing City. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.681-692.

*Irrigation water / Water resources / Field tests / Water conservation / Wheat / Crop yield / Measurement / Soil moisture / Simulation models / Soil water movement / Water requirements / Seepage loss / China / Beijing*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15237)

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*Water requirements / Drip irrigation / Sorghum / Irrigation requirements / Soil moisture / Evapotranspiration / Water balance / Models / Field tests / Lysimetry / Taiwan*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15347)

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*Evapotranspiration / Crop yield / Water use efficiency / Water table / USA / Florida*  
(Location: HQ Call No: 631.4 G000 AME Record No: H 13851)

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*Rice / Crop-based irrigation / Irrigation practices / Paddy fields / Soil moisture / Water requirements / Crop production / Plant growth / China*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14916)

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*Drip irrigation / Irrigation effects / Tomatoes / Crop yield / India*  
(Location: HQ Call No: PER Record No: H 14271)

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*Water requirements / Irrigation water / Crop yield / Plant growth / Water resources*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14907)

14371. Sinha, T.S. 1993. Grow a good crop of Raya with saline drainage water. *Indian Farming*, 43(8):4-5.

*Water quality / Irrigation water / Salinity / Drainage / Crop yield / India*  
(Location: HQ Call No: P 3421 Record No: H 13903)

14372. Sipp, S.K.; Lembke, W.D.; Boast, C.W.; Peverly, J.H.; Thorne, M.D.; Walker, P.N. 1986. Water management of corn and soybeans on a claypan soil. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.780-784.

*Water management / Maize / Soybeans / Crop yield / Sprinkler irrigation / Soil texture / Drainage / Irrigation effects / USA / Illinois*  
(Location: HQ Call No: 631.4 G000 AME Record No: H 13852)

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*Rice / Rain-fed farming / Irrigated farming / Simulation / Mathematical models / Crop production / Nitrogen / Fertilizers / Philippines*  
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*Water requirements / Plant growth / Arid zones / Climate / Environmental effects*

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*Field tests / Maize / Crop production / Crop yield / Irrigated farming / Irrigation*

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*Simulation models / Cropping systems / Crop yield / Nitrogen / Water budget / Evapotranspiration*

(Location: HQ Call No: PER Record No: H 15027)

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*Evapotranspiration / Estimation / Soil water relations / Measurement / Calibrations*

(Location: HQ Call No: PER Record No: H 15380)

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*Water stress / Crop production / India*

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*Land use / Maize / Soils / Irrigated farming / Evaluation / China / Anshan County*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14440)

14380. **Tekinel, O.; Çevik, B.; Kirda, C. 1993.** Recent advances in irrigation of greenhouse grown crops in the Turkish Mediterranean coastal areas. In CIHEAM. IAM-B, Workshop on environmentally sound water management of protected agriculture under Mediterranean and arid climates, Bari, Italy, 16-18 July 1993. Bari, Italy: CIHEAM. pp.9.3-9.24.

*Water requirements / Plant protection / Crop production / Drip irrigation / Crop-based irrigation / Turkey*

(Location: HQ Call No: 333.91 GG20 CIH Record No: H 13979)

**Abstract:** In recent years, there has been a rapid expansion of greenhouse grown crops in the Mediterranean region of Turkey. Additionally, new irrigation techniques have also been introduced in greenhouses. The latest irrigation technology introduced in greenhouses is drip or trickle irrigation. Additionally, tensiometers have also been introduced and now widely used for irrigation timing in vegetables. Although tensiometers are not suitable for direct measurement of soil water content, they measure matrix pressure (i.e., energy status of soil water) and therefore, they are most reliable for irrigation timing, particularly in vegetables. Irrigation scheduling of conventional soil-grown greenhouse crops depends on evapotranspiration (ET) rates and readily available soil water content (about 50% of total available water within the top 30 cm soil, most active root zone under localized irrigation systems). The tensiometer readings in the range of 0-75 cb is adequate for drip irrigated crops and in most soils under greenhouse production, as non-stress conditions are usually required for high yields. Results of some case studies of drip irrigation under greenhouse conditions are discussed.

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*Irrigation scheduling / Crop yield / Groundnuts / India / Maharashtra*

(Location: HQ Call No: P 3327 Record No: H 14010)

14382. **Trout, T.; Carter, D.; Sojka, B. 1994.** Irrigation-induced soil erosion reduces yields and muddies rivers. *Irrigation Journal*, 44(1):8, 11-12.

*Erosion / Control methods / Irrigation effects / River basins / Furrow irrigation / USA / Snake River Plain*

(Location: HQ Call No: PER Record No: H 14209)

14383. **Trout, T.J.; Neibling, W.H. 1993.** Erosion and sedimentation processes on irrigated fields. *Journal of Irrigation and Drainage Engineering*, 119(6):947-963.

*Erosion / Irrigated sites / Sedimentation / Furrow irrigation / Sprinkler irrigation*

(Location: HQ Call No: PER Record No: H 13670)

**Abstract:** Soil erosion is sometimes excessive during furrow irrigation and under center pivot sprinkler systems. An understanding of erosion processes is required to predict and develop management practices to reduce irrigation induced erosion. Little erosion process research has been carried out under irrigation, but much of the extensive channel sediment transport and rainfall-induced erosion process research can be adapted to irrigated conditions. Soil erosion occurs when fluid in motion detaches and transports soil particles. Sedimentation occurs when the fluid transport capacity decreases to less than the sediment load. Hydraulic forces of moving water and soil factors such as aggregate stability and particle size determine erosion and sedimentation. Under furrow irrigation, the shear of the overland flow against the soil provides the detachment force and is a primary factor determining channel transport capacity. With sprinkler irrigation, water drop energy detaches particles, some of which may be transported downslope by shallow interrill flow if the water application rate exceeds the soil infiltration rate.

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*Land classification / Rice / Cropping systems / Mapping / Salinity / Irrigated farming / Gravity flow / Vietnam*

(Location: HQ Call No: P 3357 Record No: H 14172)

14385. **Tyagi, N.K. 1994.** Study of watertable fluctuations in selected blocks of Haryana. Paper prepared for IFPRI/ICAR Workshop on Agricultural Growth in India, New Delhi, India, 1-6 May 1994. 27p.

*Water table / Waterlogging / Statistics / Soil salinity / Tube wells / India / Haryana*

(Location: HQ Call No: P 3442 Record No: H 14572)

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*River basin development / Salinity control / Financing / Water users' associations / Case studies / USA / Colorado River*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15612)

14387. **Wanjura, D.F.; Mahan, J.R. 1994.** Thermal environment of cotton irrigated using canopy temperature. *Irrigation Science*, 14(4):199-205.

*Drip irrigation / Irrigation scheduling / Cotton / Water control*

(Location: HQ Call No: PER Record No: H 14673)

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*Sprinkler irrigation / Irrigation water / Water use / Crop yield / Germany*

(Location: HQ Call No: P 3292 Record No: H 13885)

14389. **Wood, E.F. 1994.** Scaling, soil moisture and evapotranspiration in runoff models. *Advances in Water Resources*, 17(1-2):25-34.

*Soil moisture / Evapotranspiration / Runoff / Models / Water balance / Evaporation / Remote sensing*

(Location: HQ Call No: PER Record No: H 15114)

14390. **Wright, G.C.; Rao, R.C.N. (Eds.) 1994.** Selection for water-use efficiency in grain legumes: Report of a workshop held at ICRISAT Centre, Andhra Pradesh, India, 5-7 May 1993. Canberra, Australia: ACIAR. 70p. (ACIAR technical reports 27)

*Water use efficiency / Groundnuts / Plant growth / Drought / Agricultural research / Crop production / India*

(Location: HQ Call No: 631.7.2 G000 WRI Record No: H 14134)

14391. **Xijin, W. 1993.** Coastah reclamation and its environmental control. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, R1-R35: Planning and design of irrigation and drainage systems. pp.251-260.

*Land reclamation / Environmental control / Agricultural production / China / Guangxi Autonomous Region*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15081)

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*Water use efficiency / Irrigation efficiency / Water conservation / Wheat / Cotton / Cropping systems / Irrigation scheduling / Economic aspects / China*  
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Record No: H 14919)

14393. **Xueliang, Y. 1991.** Evapotranspiration of spring wheat and irrigation schedule in high elevation regions, Qinghai Province. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.12-20.

*Evapotranspiration / Wheat / Crop yield / Irrigation scheduling / Climate / China*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 14911)

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*Soil salinity / Leaching / Irrigation water / Arid zones / Lysimetry*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 14924)

14395. **Yasseen, B.T.; Al-Omary, S.S. 1994.** An analysis of the effects of water stress on leaf growth and yield of three barley cultivars. *Irrigation Science*, 14(3):157-162.

*Plant growth / Barley / Water stress / Crop yield*  
(Location: HQ Call No: PER Record No: H 13990)

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*Food production / Cereals / Crop production / Irrigated farming / Sustainable agriculture*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15647)

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*Farmer participation / Irrigation practices / Soil moisture / Rain / Sprinkler irrigation / Peanuts / irrigation scheduling / USA*

(Location: HQ Call No: PER Record No: H 12021)

**Abstract:** Recent droughts in the humid southeastern United States have focused attention on the need for and use of supplemental irrigation. Total annual rainfall amounts are sufficient for most crops in the region. However, erratic distribution of rainfall and the low water-holding capacities of most soils in the region cause frequent drought stress in many crops. An on-farm study was conducted in southeastern Alabama to evaluate the effects of farmers' irrigation scheduling decisions on soil moisture variations in peanut fields irrigated with centre-pivot irrigation systems. The study showed that the way irrigation was practiced in this high rainfall area often caused soil moisture deficit (SMD) level higher than the desired SMD limit during over 20% of the 140-day growing season. This is partially due to farmers' tendency to delay irrigation in anticipation of rainfall which may or may not occur, as rainfall during the growing season is often erratic and local. In contrast SMD in non-irrigated fields was higher than the SMD limit for half of the growing season.

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*Wheat / Crop yield / Soil moisture / Evaporation / Mathematical models / Groundwater / China*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 14922)

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*Water resources / Irrigation efficiency / Irrigation scheduling / Crop yield / Crop production / Irrigated farming / Irrigation management / Evapotranspiration / Italy*  
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Record No: H 14899)

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(Location: HQ Call No: PER Record No: H 14582)

**Sociological and institutional aspects**

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*Legislation / Irrigation / Water law / Mozambique*  
(Location: ODI Call No: ODI Journals Record No: L 942328)

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*Institution building / Water resource management / Regional development / Organizations / Indonesia / Malaysia / Philippines / Thailand*  
(Location: HQ Call No: PER Record No: H 15307)

14403. 1994. Prospects for multifunction organizations to improve irrigated agriculture: A call for information from network members. London, UK: ODI. 28p. (ODI network paper 32)

*Farmer participation / Farmers' associations / Water users' associations / Agricultural production / Irrigation management / Organizational development*  
(Location: HQ Call No: ODI/94/32 Record No: H 14531)

14404. 1994. Saving the village tank. The Bulletin, Summer:3-5.

*Tank irrigation / Maintenance / Rehabilitation / Water harvesting / Communal irrigation systems / Farmer participation / Water users' associations / Villages / India / Tamil Nadu*  
(Location: HQ Call No: P 3610 Record No: H 15326)

14405. Abdelkader, H. 1991. Mesures politiques et organisationnelles pour promouvoir les economies d'eau-Cas des reseaux d'aspersion du perimetre des Doukkalas (Maroc) [Organizational and political measures to promote water economy: Case of sprinkler network of Doukkala Perimeter (Morocco)] In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C. Irrigation management. New Delhi, India: ICID. pp.269-283.

*Sprinkler irrigation / Political aspects / Water management / Cropping systems / Rotation / Morocco*  
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*Irrigation management / Privatization / Irrigation programs / Irrigation canals / Maintenance / Participatory management / Farmer participation*

*/ Farmers' associations / Constraints / Sri Lanka / Huruluwewa / Anuradhapura*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No:H 15441)

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*Farmer managed irrigation systems / Water users' associations / Farmers' associations / Farmer participation / Economic aspects / Nigeria*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15621)

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*Irrigation management / Privatization / Farmers' associations / Cooperatives / Arid zones / Libya*  
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*Water users' associations / Farmers' associations / Irrigation management / Farmer participation / Common property / India*  
(Location: HQ Call No: 631.7.8 G635 SIV Record No: H 14985)

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*Water users' associations / Irrigation management / Farmer participation / Participatory management / Farmers' associations / Case studies / Nigeria*  
(Location: HQ Call No: IIMI 631.7.8 G214 PRA Record No: H 14960)

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laysia, 5 to 9 October 1992. Colombo, Sri Lanka: IIMI; DSE. pp.103-104.

*Legal aspects / Agricultural development / Water rights*

(Location: HQ Call No: IIMI 631.7.8 G800 HEI Record No: H 15272)

14412. **Asnawi, S. 1994.** Technological and operational changes related to irrigation management transfer (IMT) A case study of the Sumani Pumping Irrigation Project in West Sumatra Province, Indonesia (A discussion paper) IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.1. pp.7-21.

*Irrigation management / Farmers' associations / Water users' associations / Farmer participation / Privatization / Technology transfer / Irrigated farming / Pumping / Irrigation systems / Economic aspects / Indonesia / Sumatra*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15413)

14413. **Atampugre, N. 1993.** Behind the lines of stone: The social impact of a soil and water conservation project in the Sahel. Oxford, UK: Oxfam. 168p.

*Water conservation / Soil conservation / Agroforestry / Livestock / Training / Extension / Non-governmental organizations / Poverty / Institutions / Methodology / Surveys / Sahel / Burkina Faso / Yatenga*

(Location: ODI Call No: BASahel Record No: L 941249)

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*Irrigation management / Farmer participation / Water use efficiency / Participatory management / Farmers' associations / Farmer-agency interactions / Water management / Agricultural production / Rehabilitation / Sustainability / Non-governmental organizations / Institution building / Economic aspects / Land use / Rice / Case studies / Sri Lanka / Nagudeepa / Pimburettewa*

(Location: HQ Call No: IIMI 631.7.3 G744 ATH Record No: H 15261)

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(Location: HQ Call No: IIMI 631.7.8 G000 IIM Record No: H 14944)

14416. **Aziz, Y.A. 1994.** Irrigation management transfer: Development and turnover to private water user associations in Egypt. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.11-23.

*Irrigation management / Privatization / Water users' associations / Performance / Egypt*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15442)

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*Irrigation management / Pumping / Irrigation operation / Farmer participation / Farmers' associations / Participatory management / Farmer-agency interactions / Water distribution / Philippines*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15545)

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*Institution building / Farmer-agency interactions / Irrigation management / South Asia / Pakistan / Sri Lanka*

(Location: HQ Call No: IIMI 631.7.3 G800 BAN Record No: H 1794)

14419. **Barrett, S. 1994.** Conflict and cooperation in managing international water resources. Washington, DC, USA: World Bank. Public Economics Division. 35p. (Policy research working paper 1303)

*International law / Pollution / Water use efficiency / Equity / Dams / River basin development / Water shortage / Irrigation / USA / Mexico / Canada / Netherlands / Germany / India / Pakistan / Egypt / Ethiopia / Sudan / Colorado River / Columbia River / Indus River / Rhine River / Nile River*

(Location: ODI Call No: R-IBRD WPS 1303 Record No: L 941554)

14420. **Bastiaansen, J.; Huibers, F. 1994.** Conception des réseaux pour les groupements d'utilisateurs - Exemples d'Afrique. [Designing for water users organizations - Examples from Africa] Grid, 5:4-5.

*Water users' associations / Irrigation design / Africa*

(Location: HQ Call No: P 3613 Record No: H 15363)



14421. **Bastlaansen, J.; Huibers, F. 1994.** Designing for water users organizations - Examples from Africa. Grid, 5:4-5.

*Water users' associations / Irrigation design / Africa*

(Location: HQ Call No: P 3572 Record No: H 15056)

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*Irrigation management / Privatization / Farmer participation / Philippines*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15447)

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*Irrigation management / Privatization / Land reform / Water users' associations / Private ownership / Environmental effects / Uzbekistan*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15443)

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*Irrigation management / Farmers' associations / Farmer participation / Flood plains / Nigeria*

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*Farmer managed irrigation systems / Farmer participation / Water users' associations / Indonesia*

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*Irrigation programs / Small-scale systems / Social impact / Irrigation management / Privatization / Peru / Arequipa*

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*Farmer-agency interactions / Farmers' attitudes / Farmer participation / Farmers' associations / Irrigation management / Irrigation systems / Water supply*

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(Location: HQ Call No: IIMI 631.7.3 G935 FAR Record No: H 14112)

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*Irrigation systems / Farmers' associations / Farmer participation / Irrigation management / Economic analysis / Sri Lanka / South Asia*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14341)

**Abstract:** The objective of this paper is to present the recent advances and trends in the management of irrigation systems in Sri Lanka. It elaborates the

concept of participation of the beneficiaries in the management of irrigation systems in the local setting. The paper briefly presents the recent in-country experiences in this regard and describes the supporting policies and strategies which are now being formulated by the government to promote beneficiary participation in irrigation management. The policies and strategies so described include: the formation of farmers' organizations (FOs); the institutional strengthening of the FOs and irrigation agencies; the management turnover of irrigation systems to the FOs; the sharing of O&M and rehabilitation costs; the revision of legal framework etc. It concludes that beneficiary participation in irrigation management is an essential policy as well as a strategy to improve the efficiency, productivity, profitability and sustainability of irrigation systems in Sri Lanka.

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*Water resource management / Government managed irrigation systems / Privatization / Water users / Water policy / Farmer-agency interactions / Governmental interrelations*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15415)

14454. **Ganesan, R. 1993.** Strategic approaches to enhance participation of farmer clients in agricultural development schemes. *Journal of Rural Development*, 12(4):471-475.

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*Irrigation systems / Farmers' associations / User charges / Water rates / Water management / Surface irrigation / Pumps / China*

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*Water users' associations / Farmers' associations / Farmer participation / Irrigation management / Participatory management / Training / Water management / Case studies / Indonesia*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15552)

14458. **Gera, P. 1994.** Farmers' participation in an externally catalysed irrigation system: The case of johad, Rajasthan. In Sivamohan, M.V.K.; Scott, C.A. (Eds.), *India: Irrigation management partnerships*. Hyderabad, India: Booklinks Corporation. pp.389-418.

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(Location: HQ Call No: 631.7.8 G635 SIV Record No: H 15004)

14459. **Gidado, L.A. 1994.** The role of co-operatives in Nigeria. In Pradhan, P.; Abdulmumin, S. (Eds.), *Participatory irrigation management in Nigeria: Proceedings of a National Seminar held at National Water Resources Institute, Kaduna, Nigeria, 9-10 November 1993*. Kaduna, Nigeria: NWRI. pp.28-31.

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*Non-governmental organizations / Rural development / Nigeria*

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*Water users' associations / Sustainability / Farmer participation / Farmers' attitudes / Rural development / Asia / Philippines / Sri Lanka*

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(Location: HQ Call No: 631.7.8 G000 USA Record No: H 14482)

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*Small scale systems / Irrigation systems / Farmer participation / Water users / Environmental effects / Social aspects / Gender / Women / Participatory rural appraisal*

(Location: HQ, ODI Call No: P 3595 Record No: H 15281)

14464. **Hakim, M.A.; Parker, D.E. 1994.** Grameen Bank Tubewell Irrigation Program: A case of management transfer in Bangladesh. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Draft conference papers. Vol.2. pp.97-110.

*Tube well irrigation / Irrigation programs / Performance / Irrigation management / Privatization / Case studies / Bangladesh*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15449)

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*Organizational design / Irrigated farming / China / Beijing*

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*Farmers' associations / Water users' associations / Irrigation management / Indonesia*

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*Farmer managed irrigation systems / Irrigation design / Training needs assessment / Social aspects / Africa*

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*Irrigation management / Privatization / Water management / Organizations / Water users' associations / Public ownership / Private ownership / Financing / Irrigation canals / China*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15580)

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*Irrigation management / Water management / Farmers' associations / Agricultural production / Taiwan*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15555)

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(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15544)

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(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15358)

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*Irrigation management / Training needs assessment / Farmers' associations / Italy*

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*Water law / Water demand / Water shortage / Pricing / Water transfer / Irrigation water / USA / California*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15651)

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*Irrigation management / Dams / Case studies / Water rights / Low lift irrigation / Water lifting / Water distribution / Water users' associations / India / Maharashtra*

(Location: HQ Call No: 631.7.8 G635 SIV Record No: H 15003)

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*Irrigation management / Privatization / Farmer managed irrigation systems / Private ownership / Tanzania*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15452)

14480. **Kaipeng, J. 1994.** Irrigation management transfer in China. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.125-127.

*Irrigation management / Privatization / China*

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*Water conservation / Political aspects / Farmers' associations / Farmer participation / Sri Lanka*  
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(Location: HQ Call No: IIMI 631.7.3 G730 KHA  
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*Water users' associations / Water distribution / Farmers' attitudes / Women / Irrigation design / Social aspects / Africa South of Sahara / Kenya / Senegal / Tanzania*  
(Location: HQ Call No: 631.7.1 G100 UBE  
Record No: H 13913)

14484. Kolavalli, S.; Raju, K.V. 1994. Turnover of public tubewells by Gujarat Water Resources Development Corporation. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.129-136.

*Tube wells / Government managed irrigation systems / Privatization / Water resources development / Organizations / Irrigation management / Water rates / Cooperatives / Economic aspects / India / Gujarat*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
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*Farmer participation / Participatory management / Irrigation management / Irrigation scheduling / Farmers' attitudes / Farmers' associations / India / Tamil Nadu*  
(Location: HQ Call No: 631.7.8 G635 SIV  
Record No: H 14992)

14486. Kulkarni, D.N.; Kulkarni, S.Y. 1994. Formation of WUAs' in Maharashtra: Procedural dynamics. In Sivamohan, M.V.K.; Scott, C.A.(Eds.), India: Irrigation

management partnerships. Hyderabad, India: Booklinks Corporation. pp.53-68.

*Water users' associations / Farmer managed irrigation systems / Farmer participation / Participatory management / Water rates / India / Maharashtra*  
(Location: HQ Call No: 631.7.8 G635 SIV  
Record No: H 14987)

14487. Kulshreshtha, S.N.; Brown, W.J. 1993. Role of farmers' attitudes in adoption of irrigation in Saskatchewan. Irrigation and Drainage Systems, 7(2):85-98.

*Farmers' attitudes / Technology transfer / Water management / Irrigation practices / Canada / Saskatchewan*  
(Location: HQ Call No: PER Record No: H 13681)

**Abstract:** Adoption of a new technology, such as irrigation, is a complex phenomenon. Several factors of economic and social nature contribute to the farm-level decisions affecting adoption. In this study, the role played by attitudes of potential adopters towards irrigation and its subsequent adoption on their farm unit was estimated. Two models were estimated, one incorporating only adopters' socio-economic characteristics, and the other, only their attitudes towards irrigation. Results suggest that adopters' attitude, particularly with respect to economic and environmental effects of irrigation, were significant determinants of their decision to proceed with adoption of irrigation, and have a role to play in adoption of irrigation over and above that explained by socio-economic characteristics. In particular, these results suggest that negative perceptions with respect to economics of irrigation and those related to its detrimental impacts on environmental quality, particularly through soil salinity, may be significant deterrents for adoption of irrigation. The study suggests that planning of large scale water development projects, particularly those involving irrigation, must be cognizant of attitudes of potential adopters. Furthermore, during the planning stages, more attention should be paid to the development of proper educational programs, as well as extension packages, to ensure that potential adopters formulate correct attitudes towards the new technology.

14488. Kumar, L.V. 1989. The decision-making and people's participation in irrigation: Some perceptions. Journal of Indian Water Resources Society, 9(2):36-38.

*Farmer participation / Decision making / Participatory management / Water users' associations / India*  
(Location: HQ Call No: P 3287 Record No: H 13837)

14489. Kura, M. 1994. Organisational reforms for participatory irrigation management in HJRBD. In Pradhan, P.;

Abdulummin, S. (Eds.), Participatory irrigation management in Nigeria: Proceedings of a National Seminar held at National Water Resources Institute, Kaduna, Nigeria, 9-10 November 1993. Kaduna, Nigeria: NWRI. pp.57-63.

*Participatory management / Irrigation management / Organizational change / Farmers' associations / Farmer participation / Farmer-agency interactions / Water users' associations / Nigeria*

(Location: HQ Call No: IIMI 631.7.8 G214 PRA Record No: H 14957)

14490. Lauraya, F.M.; Sala, A.L.R. 1994. Alternative support systems to strengthen irrigators' associations in Bicol, the Philippines after irrigation management turnover. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.137-144.

*Farmers' associations / Irrigation management / Privatization / Communal irrigation systems / Farmers' attitudes / Participatory management / Philippines / Bicol*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15453)

14491. Lauraya, F.M.; Wijayarathna, C.M.; Vermillion, D.L. (Eds.) 1994. Information support systems for farmer managed irrigation: Selected Proceedings of the Asian Regional Workshop on the Inventory of Farmer Managed Irrigation Systems and Management Information Systems, Tagaytay City, Philippines, 13-15 October 1992. Colombo, Sri Lanka: IIMI. iv, 305p.

*Farmer managed irrigation systems / Irrigation management / Information systems / Communal irrigation systems / Management Information Systems / Case studies / Philippines / Indonesia / Malaysia / Thailand / Nepal / Bangladesh / Portugal*

(Location: HQ Call No: IIMI 631.7.3 G570 LAU Record No: H 14762)

14492. Layton, J.J.; Santopolo, F.A.; Naguib, M. 1994. Social power, water control and irrigation systems: The Egyptian farmers' ability to obtain irrigation water. Irrigation and Drainage Systems, 7(4):291-304.

*Farmer participation / Farmer-agency interactions / Water control / Irrigation efficiency / Egypt*

(Location: HQ Call No: PER Record No: H 15506)

14493. Le Gal, P.Y. 1992. Informal irrigation: A solution for Sahelian countries? Some remarks from case studies in the Senegal River Delta. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven,

Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.779-788.

*Farmers' associations / Case studies / Farmers' attitudes / River basins / Rice / Irrigated farming / Economic aspects / Senegal / Sahel*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14458)

14494. Legoupil, J.C.; Pouya, A.M. 1994. Self-management of irrigation systems: The farmer cooperatives in Niger. Bulletin du Réseau Irrigation Afrique de l'Ouest, No.4:19-23.

*Farmers' associations / Cooperative farming / Credit / Policy / Farmer-agency interactions / Niger*

(Location: HQ Call No: PER Record No: H 14578)

14495. Lele, S.N.; Patil, R.K. 1994. Farmer participation in irrigation management - A case study of Maharashtra. New Delhi, India: Horizon India Books. 244p.

*Farmer participation / Irrigation management / Case studies / India / Maharashtra*

(Location: ICID Record No: 26130)

14496. Lele, S.N.; Patil, R.K. 1994. Lessons for farmers' participation in major irrigation projects A case study of Shri Datta Water Distribution Co-operative Society, Maharashtra. In Sivamohan, M.V.K.; Scott, C.A. (Eds.), India: Irrigation management partnerships. Hyderabad, India: Booklinks Corporation. pp.151-179.

*Farmer participation / Participatory management / Irrigation management / Farmers' associations / Water policy / Water rights / Irrigation programs / Water use efficiency / Social aspects / Economic aspects / Case studies / India / Maharashtra*

(Location: HQ Call No: 631.7.8 G635 SIV Record No: H 14993)

14497. Lele, S.N.; Patil, R.K. 1992. Working for farmers' participation in major irrigation projects: A case study of Shri Datta Water Distribution Co-operative Society, Chanda, Ahmednagar District. Paper submitted to "National Workshop on Farmers Participation in the Management of Irrigation Systems," held at Administrative Staff College of India, Hyderabad, January 1992. 43p.

*Farmer participation / Irrigation management / Farmers' associations / Water users' associations / Water distribution / Water delivery / Irrigation programs / Water policy / Water rights / Economic aspects / Cooperatives / Irrigation canals / India / Ahmednagar District*

(Location: HQ Call No: P 3583 Record No: H 15175)

14498. Lintag, C.C. 1979. Irrigators' Association Development Program in Philippine Irrigation System. In IRRI. Irrigation and Water Management Department, Background papers on social, economic, communication and



institutional issues in irrigation water management. Vol.3. 11p.

*Farmers' associations / Irrigation programs / Development projects / Philippines*

(Location: HQ Call No: P 3283 Record No: H 13816)

14499. **Lonsway, K.A.; Amadou, A. 1994.** The transfer of irrigation management to farmer organizations in Niger. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.145-154.

*Irrigation management / Privatization / Policy / Farmers' associations / Cooperatives / Niger*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15454)

14500. **Makadho, J.M.; Hoogendam, P. 1993.** Institutions, markets and design. In Ubels, J.; Horst, L. (Eds.), Irrigation design in Africa: Towards an interactive method. Wageningen, Netherlands: Wageningen Agricultural University. pp.59-70.

*Organizational design / Irrigation programs / Irrigation design / Planning / Marketing / Farmers' associations / Case studies / Farming systems / Economic aspects / Institution building / Senegal / Zimbabwe*

(Location: HQ Call No: 631.7.1 G100 UBE Record No: H 13914)

14501. **Mallorie, E. 1994.** Grameen Krishi Foundation: A multifunction organisation. London, UK: ODI. 15p. (ODI network paper 29)

*Groundwater irrigation / Non-governmental organizations / Farmers' associations / Bangladesh*

(Location: HQ Call No: ODI/94/29 Record No: H 14527)

14502. **Maloney, C.; Raju, K.V. 1994.** The role of farmers' organisations in environmentally beneficial water management. In Sivamohan, M.V.K.; Scott, C.A. (Eds.), India: Irrigation management partnerships. Hyderabad, India: Booklinks Corporation. pp.69-87.

*Farmers' associations / Water management / Farmer participation / Participatory management / Irrigation management / Watersheds / Water harvesting / India*

(Location: HQ Call No: 631.7.8 G635 SIV Record No: H 14988)

14503. **Mandal, M.A.S.; Parker, D.E. 1994.** The evolution and implications of decreased public involvement in minor irrigation management in Bangladesh. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.155-170.

*Small scale systems / Performance / Privatization / Irrigation management / Public ownership / Bangladesh*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15455)

14504. **Manig, W. 1991.** Appropriate organizations and management measures in mechanized irrigation systems for peasant farmers in developing countries. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C. Irrigation management. New Delhi, India: ICID. pp.312-322.

*Farmers' associations / Irrigation management / Irrigation systems / Irrigation operation / Automation / Mechanization / Rural development / Developing countries*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14936)

14505. **Matthews, O.P. 1994.** Changing the appropriation doctrine under the Model State Water Code. Water Resources Bulletin, 30(2):189-196.

*Water law / Water policy / Water management / USA*

(Location: HQ Call No: PER Record No: H 14706)

14506. **Maurya, P.R. 1993.** Partial turnover of management of Nigerian large scale irrigation project to farmers: Constraints and solution. Q.45, R. 4, ICID 15th Congress, The Hague, Netherlands, 1993. pp.51-65.

*Farmer managed irrigation systems / Privatization / Farmer participation / Irrigation operation / Farmers' associations / Water users / Irrigation management / Large-scale systems / Nigeria*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 13747)

**Abstract:** The Federal Government's recent policy to commercialize the Nigerian River Basin Development Authorities (RBDAs) that manage large scale irrigation systems, covering a little over 100,000 hectares of land under irrigation has forced authorities to become self-financing. The RBDAs are currently trying to generate more funds to survive while increasing the rate of water charge and its recovery rate. The present systems of management is not likely to improve the operation and maintenance efficiency due to several limitations even after collecting the recently increased (double) rate of water charges. Presently the overall irrigation efficiency of these large scale irrigation projects is about 25-35%; the relative water supply to sectors range from 20-60%, low cropping intensity (150-160%), and net return per unit area has decreased due to high cost of production and low crop yield. It means water allocation, distribution and scheduling, increase in cropping intensity, yield, and net return are likely to play major roles in improving the management. Proposals to expand the role of

farmers in management are in the pipeline. Turnover of major management responsibilities (such as water distribution, allocation and scheduling, maintenance of delivery systems after the main canal, water fee allocation and socio-economic welfare) to the farmers could be one of the better solutions to efficient management of the system. Some of the activities such as project rehabilitation, land consolidation, effective crop production and resource allocation technology, and strengthening farmer organizations (water users' group in particular) are required before the turnover process begins. The possible modalities of partial turnover of management to farmers has been briefly discussed in this paper.

14507. **Mehta, O.P.; Jain, K.P. 1993.** Farmers' participation in management and maintenance. In Jurriens, M.; Jain, K.P. (Eds.), *Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands*. New Delhi, India: ILRI/WALMI. pp.221-231.

*Maintenance / Farmer participation / Irrigation management / Water users' associations / Case studies / India / Pakistan / Maharashtra / Andhra Pradesh / Kerala / Tamil Nadu / Gujarat / Madhya Pradesh*

(Location: HQ Call No: 631.7.1 G635 JUR  
Record No: H 15147)

14508. **Meijers, T.; Ombara, D.; van der Zaag, P. 1993.** Design as an interactive process: Shaping irrigation systems with the users. In Ubels, J.; Horst, L. (Eds.), *Irrigation design in Africa: Towards an interactive method*. Wageningen, Netherlands: Wageningen Agricultural University. pp.71-92.

*Irrigation design / Irrigation systems / Farmer participation / Social aspects / Villages / Africa / Kenya / Senegal*

(Location: HQ Call No: 631.7.1 G100 UBE  
Record No: H 13915)

14509. **Menchaca, J.C.M.; Torregrosa, M.L. 1994.** Social aspects of the irrigation district transfer. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.171-179.

*Irrigation management / Privatization / Water users' associations / Social aspects / Participatory management / Policy / Mexico*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15456)

14510. **Merrey, D. 1994.** Observations on institutional aspects of irrigated agriculture. Paper presented at the Nile Valley Program Regional Workshop on the Socio-Economic Research on Improved Technology in the Nile Valley Countries, Cairo, Egypt, 30 May-2 June 1994. 8p.

*Irrigation management / Agricultural research / Institution building / Participatory management / Resource management / Egypt / Nile River*

(Location: HQ Call No: IIMI 631.7.3 G232 MER  
Record No: H 14761)

14511. **Merrey, D.J. 1993.** Institutional contexts for managing irrigated agriculture. Paper presented at the DSE/IIMI Strategy Workshop on Institutional Framework for Irrigation, Chiang Mai, Thailand, 1-5 November 1993. 21p.

*Institution building / Financing / Irrigation*

(Location: HQ Call No: IIMI 631.7.3 G000 MER  
Record No: H 4020)

14512. **Merrey, D.J. 1994.** Institutional design principles for accountability on large irrigation systems. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.1. pp.107-116.

*Irrigation management / Participatory management / Farmer participation / Government managed irrigation systems / Water users' associations / Large-scale systems*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15420)

14513. **Merrey, D.J. 1993.** Irrigation rehabilitation and modernization as socio-technical institutional-strengthening programs. Paper presented at the DSE/IIMI Strategy Workshop on Institutional Framework for Irrigation, Chiang Mai, Thailand, 1-5 November 1993. 10p.

*Rehabilitation / Modernization / Social aspects / Institution building*

(Location: HQ Call No: IIMI 631.7.3 G000 MER  
Record No: H 4013)

14514. **Merrey, D.J. 1992.** Overcoming artificial institutional barriers: Linking farming systems research with irrigation management research. Paper presented at the Asian Farming Systems Symposium, Colombo, Sri Lanka, 2-5 November 1992. 10p.

*Institution building / Irrigation management / Farming systems / Agricultural research / Sri Lanka*

(Location: HQ Call No: IIMI 631.7.3 G000 MER  
Record No: H 3619)

14515. **Mishra, R. 1994.** Dynamics of farmers' participation in the Paliganj Distributary, Sone Canal System, Bihar. In Sivamohan, M.V.K.; Scott, C.A. (Eds.), *India: Irrigation management partnerships*. Hyderabad, India: Booklinks Corporation. pp.181-199.

*Farmer participation / Irrigation management / Farmers' attitudes / Farmers' associations / Farmer-agency interactions / Irrigation systems / Canals / History / India / Bihar*

(Location: HQ Call No: 631.7.8 G635 SIV  
Record No: H 14994)

14516. **Mistry, J.F.; Modhwadia, K.E.; Nathani, K.U. 1989.** Peoples' participation in the development and management of water. *Journal of Indian Water Resources Society*, 9(2):39-41.

*Water management / Farmer participation / Water resources / Water policy / India*

(Location: HQ Call No: P 3287 Record No: H 13838)

14517. **Morrison, J.; Carruthers, I. 1994.** Manipulating irrigation management models: Institutional requirements for social engineering. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.181-191.

*Irrigation management / Models / Privatization / Maintenance / Decision making*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15457)

14518. **Murray-Rust, D.H.; Merrey, D.J. 1994.** Institutional adaptation and institutional change. In Heim, F.; Abernethy, C.L. (Eds.), *Irrigated agriculture in Southeast Asia beyond 2000: Proceedings of a Workshop held at Langkawi, Malaysia, 5 to 9 October 1992*. Colombo, Sri Lanka: IIMI; DSE. pp.105-112.

*Irrigation management / Institution building / Organizational change / Decentralization / Privatization / Irrigated farming / Agricultural policy / Performance evaluation / Asia*

(Location: HQ Call No: IIMI 631.7.8 G800 HEI Record No: H 15273)

14519. **Murray-Rust, D.H.; Merrey, D.J. 1992.** Irrigated agriculture beyond 2000: Institutional adaptation and institutional change. Paper presented at the Strategy Workshop on Irrigated Agriculture in Southeast Asia Beyond 2000, Langkawi, Malaysia, 5-9 October 1992. 10p.

*Irrigated farming / Agriculture / Institution building*

(Location: HQ Call No: IIMI 631.7.8 G000 MUR Record No: H 6130)

14520. **Musa, I.K. 1994.** Irrigation management transfer in Nigeria: A case of financial sustainability for operation, maintenance and management. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.1. pp.117-128.

*Irrigation management / Privatization / Sustainability / Farmer participation / Water users' associations / Water resources development / Nigeria*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15421)

14521. **Nandararatne, S.M.K.B. 1993.** Leadership skill development of farmer representatives in Gal Oya Irrigation

Settlement Project. Colombo, Sri Lanka ARTI. iv, 86p. (Research study no.89)

*Farmer participation / Farmers' associations / Leadership / Training / Sri Lanka / Gal Oya Project*

(Location: HQ Call No: 631.7.3 G744 NAN Record No: H 15030)

14522. **Nangju, D. 1994.** The strategies of irrigation management transfer in Nepal. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.193-201.

*Irrigation management / Privatization / Policy / Water users' associations / Nepal*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15458)

14523. **Navalawala, B.N. 1993?** Farmers' participation in irrigation management and a case study. Report of the Adviser (Irrigation and Command Area Development), Planning Commission, Government of India. 5p.

*Farmer participation / Farmers' associations / Irrigation management / Water users' associations / Case studies / India*

(Location: HQ Call No: P 3518 Record No: H 14704)

14524. **Navalawala, B.N. 1993.** Indian experience in irrigation management and farmers' participation. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.181-200.

*Irrigation management / Farmer participation / Water users' associations / Economic aspects / Agricultural production / Crop yield / Water rates / Legislation / India*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15620)

14525. **NIA; IIMI. Philippines; USAID. 1991.** Manual for the financial management system of an irrigators association. Quezon City, Philippines NIA. iv, 310p.

*Financial planning / Farmers' associations / Training / Management*

(Location: HQ Call No: IIMI 631.7.8 G732 NIA Record No: H 14231)

14526. **NIA; IIMI. Philippines. 1991.** Manual on Farmer Irrigators' Organization Program (FIOP) Quezon City, Philippines: NIA. xiv, 167p.

*Irrigation management / Farmers' associations / Training / Farmer-agency interactions / Irrigation operation / Philippines*

(Location: HQ Call No: IIMI 631.7.8 G732 NIA Record No: H 14229)

14527. **Ninh, N.D. 1994.** Strategy on irrigation management transfer in Vietnam. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.1. pp.129-135.

*Irrigation management / Privatization / Strategic management / Water policy / Water rates / Investment / Farmers' attitudes / Vietnam*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15422)

14528. **Ogunwale, S.A.; Maurya, P.R.; Owonubi, J.J. 1994.** Farmers' views on the management of irrigation schemes in Nigeria. News from the field: News from Balochistan, Pakistan; Nigeria and Western Thar Desert, India. London, UK: ODI. pp.10-19. (ODI network paper 31)

*Farmers' attitudes / Irrigation management / Performance evaluation / Nigeria*

(Location: HQ Call No: ODI/94/31 Record No: H 14529)

14529. **Olatunji, O.T. 1994.** The role of farmers, local and community institutions in participatory irrigation development. In Pradhan, P.; Abdulmumin, S. (Eds.), Participatory irrigation management in Nigeria: Proceedings of a National Seminar held at National Water Resources Institute, Kaduna, Nigeria, 9-10 November 1993. Kaduna, Nigeria: NWRI. pp.32-34.

*Participatory management / Irrigation management / Farmer participation / Nigeria*

(Location: HQ Call No: IIMI 631.7.8 G214 PRA Record No: H 14952)

14530. **Olin, M. 1994.** Transfer of management to water users in stages I and II of the Bhairawa- Lumbini Groundwater Irrigation Project in Nepal. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.1. pp.137-149.

*Irrigation management / Privatization / Water users / Farmer participation / Farmers' attitudes / Groundwater irrigation / Deep tube wells / Water rates / Water users' associations / Nepal*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15423)

14531. **Olofin, E.A. 1994.** Land ownership relation and participatory irrigation management in Northern Nigeria. In Pradhan, P.; Abdulmumin, S. (Eds.), Participatory irrigation management in Nigeria: Proceedings of a National Seminar held at National Water Resources Institute, Kaduna, Nigeria, 9-10 November 1993. Kaduna, Nigeria: NWRI. pp.51-56.

*Participatory management / Irrigation management / Land ownership / Land tenure / Nigeria*

(Location: HQ Call No: IIMI 631.7.8 G214 PRA Record No: H 14956)

14532. **Omotowoju, J.S. 1994.** Formation of water users association. In Pradhan, P.; Abdulmumin, S. (Eds.), Participatory irrigation management in Nigeria: Proceedings of a National Seminar held at National Water Resources Institute, Kaduna, Nigeria, 9-10 November 1993. Kaduna, Nigeria: NWRI. pp.41-50.

*Water users' associations / Irrigation management / Farmer participation / Training / Nigeria*

(Location: HQ Call No: IIMI 631.7.8 G214 PRA Record No: H 14955)

14533. **Oorthuizen, J. 1994.** It takes two to tango: A case study of irrigation management transfer in the Philippines. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.1. pp.151-156.

*Irrigation management / Privatization / Farmers' associations / Case studies / Philippines*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15424)

14534. **Oorthuizen, J.; Slood, G. 1993.** Privatization in irrigation: A case study of the Ogsong River Irrigation System Irrigation Association. Quezon City, Philippines: Philippine Peasant Institute. viii, 66p.

*Privatization / Irrigation management / Cost recovery / Farmer participation / Rural development / Case studies / Philippines*

(Location: HQ Call No: 631.7.3 G732 OOR Record No: H 15193)

14535. **Orii, K. (Ed.) 1994.** Trial research report on a comparative study of irrigation institutions in Asia. Daito Bunka University, Saitama-Ken, Japan. xi, 277p.

*Irrigation systems / Farmers' associations / Farmer participation / Rice / History / Water control / Water law / Asia / Malaysia / Japan / Thailand / Myanmar / Egypt*

(Location: HQ Call No: P 3347 Record No: H 14325)

14536. **Ostrom, E. 1993.** Bargaining over the rules: How self-organized farmer organizations constitute their own rule-ordered situations. Paper presented at Conference on Hierarchies, Markets, Power in the Economy: Theories and Lessons from History, Castellanza (Varese), Italy, 15-17 December 1993. 53p.

*Farmers' associations / Farmer managed irrigation systems / Farmers' attitudes / Social aspects*

(Location: HQ Call No: P 3356 Record No: H 14171)

**Abstract:** An earlier version of this paper was presented at a conference on Heterogeneity and Collective Action, Workshop on Political Theory

and Policy Analysis, Indiana University, Bloomington, Indiana, USA, 14-17 October 1993.

14537. **Palacios-Vélez, E. 1994.** Performance of water users associations in the operation and maintenance of irrigation districts in Mexico. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.203-213.

*Water users' associations / Performance / Privatization / Mexico*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15459)

14538. **Palmer-Jones, R.W. 1994.** The turnover of deep tubewells for irrigation. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.215-230.

*Tube well irrigation / Privatization / Irrigation management / Asia / Pakistan / India / Bangladesh / Indonesia / Philippines / Nepal / China*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15460)

14539. **Pant, N. 1994.** The turnover of public tubewells in Uttar Pradesh: A case study of a successful cooperative society. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.231-242.

*Irrigation management / Privatization / Tube wells / Cooperatives / Case studies / India / Uttar Pradesh*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15461)

14540. **Patel, K.N.; Gulati, O.T. 1994.** Farmers' participation from micro to macro: The Ankav Subminor in the Mahi Project, Gujarat. In Sivamohan, M.V.K.; Scott, C.A. (Eds.), India: Irrigation management partnerships. Hyderabad, India: Booklinks Corporation. pp.123-139.

*Farmer participation / Participatory management / Irrigation management / Irrigation programs / Case studies / Extension / India / Gujarat*

(Location: HQ Call No: 631.7.8 G635 SIV Record No: H 14991)

14541. **Patil, R.K.; Lele, S.N. 1994.** Irrigation management transfer: Problems in implementation. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.1. pp.157-163.

*Irrigation management / Privatization / Water users' associations / Participatory management / Water policy / Legal aspects / Water budget / India*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15425)

14542. **Pendse, M.D.; Bhogle, S.G. 1994.** Participatory irrigation management in Maharashtra. Training and action research. In Sivamohan, M.V.K.; Scott, C.A. (Eds.), India: Irrigation management partnerships. Hyderabad, India: Booklinks Corporation. pp.35-52.

*Irrigation management / Participatory management / Training / Water users' associations / History / Farmer participation / Policy / Non-governmental organizations / India / Maharashtra*

(Location: HQ Call No: 631.7.8 G635 SIV Record No: H 14986)

14543. **Pradhan, U. 1994.** State expectations and local interests: The context for irrigation management transfer in Nepal. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.175-183.

*Irrigation management / Privatization / History / Bureaucracy / Legal aspects / Farmer-agency interactions / Water users' associations / Water distribution / Nepal*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15564)

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*Water resources / River basin development / Organizational development / India*

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*Irrigation management / Privatization / Water distribution / Water allocation / Water rates / Price policy / Performance indexes / Australia / New South Wales*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15462)

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*Farmer participation / Irrigation management / Farmers' attitudes / Financing / Economic aspects / India / Karnataka / Bijapur*  
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(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
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*Farmer participation / Irrigation management / Policy / Legislation / Water rates / Irrigated farming / Water distribution / India / Madhya Pradesh*  
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*Irrigation management / Privatization / Sustainable agriculture / Water management / Agricultural extension / Water users / Women / Laos / Thailand*  
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*Irrigation management / Privatization / Irrigation programs / Non-governmental organizations / Case studies / India / Rajasthan*  
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Record No: H 15427)

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*Irrigation management / Privatization / Case studies / Irrigation programs / Farmers' attitudes / Farmers' associations / Water distribution / Water budget / India / Andhra Pradesh*  
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*Irrigation management / Irrigation operation / Farmer-agency interactions / Water users' associations / Farmers' associations / Computer software / Irrigation scheduling / Myanmar*  
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14566. **Sengupta, N. 1980.** The indigenous irrigation organization in South Bihar. *The Indian Economic and Social History Review*, 17(2):157-189.  
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*Irrigation management / Privatization / Farmer participation / Farmers' associations / Mathematical models*

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14568. **Shah, A.C. 1994.** Disciplined democratic process in the Samadhiala Cooperative Lift Irrigation Society, Gujarat. In Sivamohan, M.V.K.; Scott, C.A. (Eds.), *IndiaIrrigation management partnerships*. Hyderabad, India: Booklinks Corporation. pp.333-349.

*Farmers' attitudes / Irrigation programs / Cooperatives / Water rates / Agricultural credit / Economic aspects / Case studies / India / Gujarat*

(Location: HQ Call No: 631.7.8 G635 SIV Record No: H 15001)

14569. **Shah, P.; Shah, M.K. 1994.** Multifunction irrigation organisations: Advantage or handicap. London, UK: ODI. 11p. (ODI network paper 28)

*Organizational design / Organizational development / Farmers' associations / India / Gujarat*

(Location: HQ Call No: ODI/94/28 Record No: H 14526)

**Abstract:** This paper describes the experiences of an NGO, the Aga Khan Rural Support Programme (AKRSP), in supporting the formation of lift irrigation cooperatives and their performance as multifunction organizations (MFOs), in South Gujarat, India. It also examines the conditions under which Irrigation Organizations (IOs) are likely to become multifunction. It then discusses the mechanisms which facilitate the functioning of irrigation organizations and multifunction organizations.

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*Farmer participation / Watershed management / Water management / Participatory management / Agricultural extension / Water conservation / Villages / Soil conservation / Soil classification / India / Rajasthan / Gujarat*

(Location: HQ Call No: 630.715 G000 IIE Record No: H 13891)

14571. **Shah, T.; Ballabh, V.; Dobrial, K.; Talati, J. 1994.** Turnover of state tubewells to farmer co-operatives: Assessment of Gujarat's experience, India. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.1. pp.229-243.

*Tube wells / Privatization / Irrigation management / Groundwater irrigation / Organizations / Cooperatives / Performance / Farmers' associations / Economic aspects / India / Gujarat*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15432)

14572. **Sharma, P.K. 1994.** Issues and options of irrigations management transfer in the Nepalese context. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.1. pp.245-249.

*Irrigation management / Privatization / Water users' associations / Water policy / Non-governmental organizations / Nepal*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15433)

14573. **Shivakoti, G. P. 1993.** Farmers' perception of performance in farmer - and agency-managed irrigation systems in Nepal. Workshop in Political Theory and Policy Analysis, Indiana University, Indiana, USA. 46p.

*Farmer managed irrigation systems / Farmer participation / Farmer-agency interactions / Performance / Rapid methods / Rural development / Nepal*

(Location: HQ Call No: P 3355 Record No: H 14170)

14574. **Shivakoti, G.P. 1994.** Management transfer of agency-managed irrigation systems in Nepal: Are there any lessons to be learned from farmer-managed irrigation systems? IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.269-279.

*Irrigation management / Privatization / Farmer managed irrigation systems / Policy / Nepal*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15464)

14575. **Sijbrandij, P.; van der Zaag, P. 1993.** Canal maintenance: A key to restructuring irrigation management: A case of farmer participation and turnover from Mexico. *Irrigation and Drainage Systems*, 7(3):189-204.

*Irrigation canals / Maintenance / Irrigation management / Farmer participation / Privatization / Mexico*

(Location: HQ Call No: PER Record No: H 13084)

**Abstract:** Farmers becoming involved in canal maintenance is a recent trend in many government managed irrigation systems. Before being able to assess the pitfalls and perspectives of this trend, it is necessary to examine in detail the issue of canal maintenance itself, an issue which has received relatively little attention. The paper focuses on canal maintenance in an irrigation system in Western Mexico, and finds that canal maintenance



differs in several aspects from water distribution. A first difference is that water distribution often results in competition among water users along the same canal, whereas the need for canal maintenance may bring these people together in cooperation, which may help to forestall possible conflicts over water supply. A second important difference is that water distribution is directly productive, whereas canal maintenance involves the reproduction of the canal system, the (often considerable) costs involved being investments. In the case study reviewed, canal maintenance gave rise to certain relationships between different groups of people, and between them and the canal infrastructure, relationships which may not have been uncovered if only water distribution had been studied. It is argued that interventions aimed at handing over management responsibilities to water users would be more effective if such locally specific expressions of cooperation and initiative of the actors involved are taken as a starting point.

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*Farmer participation / Participatory management / Irrigation management / Farmers' associations / Irrigation programs / India / Andhra Pradesh*  
(Location: HQ Call No: 631.7.8 G635 SIV  
Record No: H 14989)

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*Irrigation management / Privatization / Case studies / Cooperatives / Performance / Villages / Water policy / Farmers' attitudes / India / Uttar Pradesh*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15434)

14578. Sinha, S. 1994. Implication of agrarian contracts for irrigation management transfer: Prospects of farmer group formation on the Rajasthan Canal Project. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.1. pp.263-274.

*Irrigation management / Privatization / Irrigation programs / Irrigation canals / Farmers' associations / Case studies / Water distribution / Water allocation / India / Rajasthan*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15435)

14579. Sivamohan, M.V.K.; Scott, C.A. 1994. Moving towards the concept of "partnership" in irrigation management in India. In Sivamohan, M.V.K.; Scott, C.A. (Eds.), India: Irrigation management partnerships. Hyderabad, India: Booklinks Corporation. pp.3-13.

*Irrigation management / Policy / History / Water users' associations / Farmer-agency interactions / India*  
(Location: HQ Call No: 631.7.8 G635 SIV  
Record No: H 14984)

14580. Srivastava, L.P. 1994. At the doorstep of transfer: Paligani Distributary of Sone Canal System, Bihar, India. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.281-294.

*Irrigation canals / Irrigation management / Privatization / Farmer participation / Legal aspects / India / Bihar*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15465)

14581. Subramaniam, K. 1994. Science and ethics in public decision-making: Case of big dams. Economic and Political Weekly, 29(14):813-818.

*Dams / Legal aspects / Common property / Environmental effects / India / Narmada Project*  
(Location: ODI Record No: L 941021)

14582. Svendsen, M.; Vermillion, D. 1994. Lessons from management transfer in the Columbia Basin Project, USA. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.243-256.

*Irrigation management / Privatization / Policy / Developing countries / USA / Columbia River*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15571)

14583. Ta, N.M. 1994. Irrigation management transfer (IMT) in Vietnam. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.153-159.

*Irrigation management / Privatization / Agricultural development / Irrigated farming / Farmer participation / Farmers' associations / Local management / Vietnam*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15562)

14584. Tang, S.Y. 1993. Integrating local participation and institutional development: A transaction cost perspective. Research in public administration. Vol.2. pp.213-233.

*Institution building / Organizational development / Farmer participation / Farmers' attitudes / Economic aspects / Cost benefit analysis / Irrigation*

(Location: HQ Call No: P 3297 Record No: H 13900)

14585. **Tao, S.; Xu, Z.; Li, Y. 1994.** Yanqing: An irrigation system fully managed by farmers. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.225-227.

*Small scale systems / Farmer managed irrigation systems / Irrigation management / Economic aspects / Privatization / China*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15569)

14586. **Tapay, N. 1979.** Case studies of farmer irrigators in the lower Talavera River Irrigation System. In IRRI. Irrigation and Water Management Department, Background papers on social, economic, communication and institutional issues in irrigation water management. Vol.3. 19p.

*Water distribution / Farmers' associations / Case studies / Farmers' attitudes / Social organization / Philippines*

(Location: HQ Call No: P 3283 Record No: H 13813)

14587. **Tapay, N. 1979.** Institutional issues in water management. In IRRI. Irrigation and Water Management Department, Background papers on social, economic, communication and institutional issues in irrigation water management. Vol.3. 10p.

*Irrigation management / Water management / Social organization / Institutions / Water distribution / Water use / Water rights / Philippines*

(Location: HQ Call No: P 3283 Record No: H 13815)

14588. **Tapay, N. 1979.** The sociology of irrigation water management. In IRRI. Irrigation and Water Management Department, Background papers on social, economic, communication and institutional issues in irrigation water management. Vol.3. 14p.

*Irrigation management / Water management / Sociological analysis / Training / Farmers' attitudes*

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*Water resource management / Irrigation systems / Case studies / Thailand / Sanpatong District / Chiang Mai Province*

(Location: ODI Call No: I 200. RRMG Record No: L I 200)

14590. **Thuan, H.L. 1994.** Irrigation management transfer in Vietnam. In IIMI, International Conference on Irriga-

tion Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.257-262.

*Irrigation management / Privatization / Farmer participation / Rehabilitation / Vietnam*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15572)

14591. **Torregrosa, M.L. 1994.** Social aspects of irrigation district transfer. Water Resources Development, 10(3):351-360.

*Irrigated sites / Water users' associations / Social aspects / Modernization / Participatory management / Water policy / Mexico*

(Location: HQ Call No: PER Record No: H 15475)

14592. **Triphathi, S.K.; Chandra, B. 1989.** Organising farmers for improving agricultural production in Upper Ganga Command. Journal of Indian Water Resources Society, 9(2):31-35.

*Farmers' associations / Water use / Conjunctive use / Agricultural production / India / Uttar Pradesh*

(Location: HQ Call No: P 3287 Record No: H 13836)

14593. **Turrall, H. 1994.** Strategic water resources management and decentralised local water management organisations: Institutional implications and issues. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.333-339.

*Irrigation management / Privatization / Water rights / Farmers' attitudes / Water users' associations / Water resource management / Groundwater / Bureaucracy / Institutional constraints / Economic aspects*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15583)

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*Irrigation management / Farmer participation / Performance evaluation / Labor / Irrigation programs / Policy / Participatory management / Case studies / Sri Lanka / Kimbulwana Oya*

(Location: HQ Call No: IIMI 631.7.3 G744 UPA Record No: H 14779)

14595. **Vadhanaphong, B. 1994.** Operation and maintenance of Khlong Wangtanote Lift Irrigation Project. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.235-241.

*Irrigation programs / Maintenance / Water lifting / Irrigation operation / Pipes / Water users' associations / Thailand*

(Location: HQ Call No: 631.7.6.3 G750 FAO  
Record No: H 14881)

14596. **Vaidyanathan, A. 1994.** Irrigation management transfer: An Indian perspective. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994: Draft conference papers. Vol.2. pp.295-301.

*Irrigation management / Privatization / Groundwater / Surface irrigation / Small scale systems / Large-scale systems / Policy / Water users / Participatory management / India*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15466)

14597. **van den Dries, A.; Hoogendam, P. 1993.** Effects of intervention on water use in farmer-managed irrigation systems of North-East Portugal. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.181-190.

*Water use / Farmer managed irrigation systems / Water distribution / Water allocation / Farmer participation / Portugal*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15076)

14598. **van der Zaag, P. 1993.** Factors influencing the operational flexibility of three farmer-managed irrigation systems in Mexico. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.651-661.

*Farmer managed irrigation systems / Irrigation operation / Irrigation systems / Private ownership / Water users' associations / Communal irrigation systems / Water rights / Water demand / Water supply / Water distribution / Irrigation canals / Mexico*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15235)

14599. **van Hofwegen, P.J.M.; Meijer, C.M. 1993.** Water-boards in the Netherlands: Institutional and financial aspects. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century. Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.339-354.

*Institutions / Economic aspects / Legislation / Water management / Netherlands*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15630)

14600. **van Nes, A. 1993.** Adaptation to the needs and abilities of users and operators - experience of the Pom-pengan Irrigation Project, Indonesia. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century. Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.257-271.

*Irrigation programs / History / Irrigation operation / Maintenance / Farmer participation / Farmers' attitudes / Water users' associations / Irrigation design / Farmer-agency interactions / Indonesia*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15624)

14601. **Vaquié, P.F.; Salhorgne, D.; Boilloux, V. 1993.** Role des CUMA pour optimiser l'utilisation du matériel d'irrigation et l'usage de la ressource. [Role of "CUMA" in optimizing the use of irrigation material and the use of the resource] ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century. Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.155-165.

*Cooperatives / Farmer participation / Irrigation programs / Optimization / France*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15618)

14602. **Vermillion, D.; Xinyuan, W.; Xiying, Z.; Xuesen, M. 1994.** Institutional reform in two irrigation districts in North China: A case study from Hebei Province. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.267-281.

*Irrigation management / Privatization / Policy / Case studies / Institution building / Organizational change / Water rates / Financing / Water management / China / Hebei Province*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15574)

14603. **Vermillion, D.L. 1994.** Entrusting irrigation to water users: International experiences with management turnover. *Economic Review*, 20(6):10-14, 19.

*Irrigation management / Privatization / Water users / Private ownership / Asia / Africa / Latin America*

(Location: HQ Call No: P 3608 Record No: H 15298)

14604. **Vincent, L.; Friend, R.; Southgate, C. 1994.** Diversity and change in local water management institutions.

London, UK: ODI. RRMG. 99p. (Rural Poverty and Resources Research Programme working paper no.7)

*Irrigation management / Villages / Water management / Thailand / Tanzania / Karen / Hmong*

(Location: ODI Call No: R-RPRRP WP no. 7  
Record No: L 940717)

14605. **Vincent, L. 1993.** Irrigation, poverty and resource poor farmers. London, UK: ODI. 29p. (Rural Poverty and Resources Research Programme working paper no.3)

*Sustainability / Agriculture / Rural development / Irrigation / Social aspects*

(Location: ODI Call No: R-RPRRP WP no. 3  
Record No: L 941011)

14606. **Vincent, L. 1994.** Lost chances and new futures: Interventions and institutions in small-scale irrigation. Land Use Policy, 11(4):309-322.

*Small scale systems / Irrigation systems / Development policy / Land use*

(Location: HQ, ODI Call No: P 3595 Record No: H 15282)

14607. **Vlaar, J.C.; Brasseur, M.B. 1992.** Mauvaises previsions de la participation de la main-d'oeuvre a la construction des digues filtrantes au Burkina Faso. [Bad forecasting of labour participation in the construction of permeable infiltration dams in Burkina Faso] Bulletin de Liaison du Comite Interfricain d'Etudes Hydrauliques, No.89.July:34-46.

*Water conservation / Soil conservation / Labor / Farmer participation / Farmers' associations / Burkina Faso*

(Location: ODI Call No: ODI Journals Record No: L 942392)

14608. **Wang, Y.; Xu, H. 1994.** Irrigation management transfer in Yanguan Town of Zhejiang Province in China. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.303-306.

*Irrigation management / Privatization / Economic aspects / China*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15578)

14609. **Water and Land Management Training and Research Institute (WALAMTARI) 1993.** Proceedings of the National Seminar on Human Resource Development in Irrigation Management, 3-4 September 1993. Andhra Pradesh, India: WALAMTARI. 160p.

*Irrigation management / Human resource development / India*

(Location: ICID Record No: 26160)

14610. **Weissing, F.; Ostrom, E. 1993.** Irrigation institutions and the games irrigators play: Rule enforcement on government - and farmer-managed systems. In Fritz, W.S. (Ed.), Games in hierarchies and networks: Analytical and

empirical approaches to the study of governance institutions. Boulder, CO, USA: Westview Press. pp.387-428.

*Farmer managed irrigation systems / Irrigation management / Government managed irrigation systems*

(Location: HQ Call No: P 3341 Record No: H 14048)

14611. **Wen, L. 1993.** Reorganization of irrigation associations for irrigation and drainage systems management in Taiwan R.O.C. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.21-41.

*Organizations / Irrigation systems / Farmers' associations / Taiwan*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 9950)

14612. **Whitby, C. 1994.** Community participation in lift irrigation management in Panchmahals district Gujarat. In Sivamohan, M.V.K.; Scott, C.A. (Eds.), India: Irrigation management partnerships. Hyderabad, India: Booklinks Corporation. pp.351-368.

*Low lift irrigation / Water lifting / Irrigation management / Farmer participation / Cooperatives / Communal irrigation systems / Policy / Water distribution / Villages / Community development / Economic aspects / Women in development / India / Gujarat*

(Location: HQ Call No: 631.7.8 G635 SIV  
Record No: H 15002)

14613. **Wijayaratna, C.M.; Vermillion, D.L. 1994.** Irrigation management turnover in the Philippines: Strategy of the National Irrigation Administration. Colombo, Sri Lanka IIMI. v, 23p. (Short report series on locally managed irrigation no.4)

*Privatization / Irrigation management / Communal irrigation systems / Farmers' associations / Irrigation systems / Costs / Philippines*

(Location: HQ Call No: IIMI 631.7.3 G732 WIJ  
Record No: H 14218)

14614. **Wijayaratna, C.M. 1994.** A methodology to assess the organizing process of irrigation management transfer. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Draft conference papers. Vol.1. pp.287-296.

*Irrigation management / Privatization / Research methods / Documentation / Philippines*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15437)

14615. **Wijayaratna, C.M. 1994.** Sustainability of farmers organizations. Economic Review, 20(6):25-28.

*Farmers' associations / Farmer participation / Sustainability / Institution building / Bureaucracy / Legal aspects / Training / Monitoring / Performance evaluation / Sri Lanka*

(Location: HQ Call No: P 3608 Record No: H 15302)

**Abstract:** Article based on a paper "Institutionalization of participatory management. Sustainability of farmer organizations" presented at the Second Asian Farming Systems Symposium, 2-5 November 1992, Colombo, Sri Lanka.

14616. **Wilkins-Wells, J.; Molden, D.J.; Pradhan, P.; Rajbhandari, S.P. 1994.** Developing share systems for sustainable water users associations in Nepal. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Draft conference papers. Vol.1. pp.275-285.

*Water users' associations / Irrigation management / Privatization / Training / Water policy / Farmer participation / Nepal*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15436)

14617. **Wilkins-Wells, J.; Prasad, K.C. 1994.** The role of rural credit institutions in irrigation management transfer. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Draft conference papers. Vol.2. pp.303-315.

*Irrigation management / Privatization / Water users' associations / Policy / Financing / Water costs / Farmer participation / Nepal*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15467)

14618. **Willardson, L.S.; Anderson, B.H. 1993.** An experience in irrigation privatization. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-F, Question 45, R30-R49: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.453-462.

*Irrigation management / Privatization / Water users' associations / Dominican Republic*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15644)

14619. **Wu, J. 1994.** Increasing irrigation benefits by irrigation management transfer. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.99-102.

*Irrigation management / Privatization / Farmer participation / China / Hebei Province*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15556)

14620. **Yan, Z.; Ma, S. 1994.** The management of village irrigation systems in the Shandong Province. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.329-331.

*Irrigation management / Farmer participation / Irrigation systems / Villages / Tube wells / Contracts / Rural economy / Evaluation / China*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15582)

14621. **Yap-Salinas, L.H. 1994.** Converging factors in the successful transfer of irrigation management responsibilities to water users associations in the Dominican Republic. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Draft conference papers. Vol.2. pp.117-127.

*Irrigation management / Privatization / Water users' associations / Rural development / Irrigation programs / Farmers' attitudes / Dominican Republic*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15451)

14622. **Yi, Y. 1994.** Irrigation management transfer in Laofangqiao Town of Yuyao City in China. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.307-311.

*Irrigation management / Privatization / Water users / Villages / Farmer participation / China*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15579)

14623. **Yoder, R. 1994.** Locally managed irrigation systems: Essential tasks and implications for assistance, management transfer and turnover programs. Colombo, Sri Lanka IIMI. vii, 97p. (Monograph no.3)

*Irrigation management / Irrigation systems / Irrigation scheduling / Privatization / Farmer participation / Water management / Water rights / Water allocation / Resource management / Organizational dynamics / Conflict / Communication / Training / Nepal / Indonesia / Philippines*

(Location: HQ Call No: IIMI 631.7.3 G726 YOD Record No: H 11888)

14624. **Yoder, R. 1994.** Locally-managed irrigation systems: Suggestions for management transfer. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Draft conference papers. Vol.1. pp.297-305.

*Irrigation management / Privatization / Irrigation systems / Water distribution / Water allocation / Monitoring / Training*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15438)

14625. **Yoder, R. 1994.** Organization and management by farmers in the Chhattis Mauja Irrigation System, Nepal. Colombo, Sri Lanka: IIMI. xiii, 149p. (Research paper no.11)

*Irrigation management / Canal irrigation / Water distribution / Water allocation / Decision making / Agriculture / Farmer managed irrigation systems / Groundwater / Percolation / Drainage / Seepage / Performance / Maintenance / Cost benefit analysis / Crop yield / Rice / Wheat / Maize / Nepal*  
(Location: HQ Call No: IIMI 631.7.3 G726 YOD Record No: H 14962)

14626. **Yoganarsimhan, G.N. 1989.** Some musings on people's participation in irrigation water management. Journal of Indian Water Resources Society, 9(2):22-25.

*Farmer participation / Irrigation management / Participatory management*  
(Location: HQ Call No: P 3287 Record No: H 13834)

14627. **Zhou, Z. 1994.** Yellow River Irrigation Management Organization transfer and results analysis in Shouzhongji township. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.325-328.

*Irrigation management / Privatization / Organizations / Financial planning / Farmers' associations / Water resources development / Irrigation programs / Farmer participation / China*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15581)

#### Economic aspects

14628. **Allam, M.N.; Ellassiouti, I.M.; Riley, P. 1994.** Irrigation water cost in Egypt. Water International, 19(3):145-151.

*Water costs / Irrigation water / Water delivery / Maintenance costs / Computer models / River basins / Egypt / Nile River*  
(Location: HQ Call No: PER Record No: H 15498)

**Abstract:** This article addresses the problem of identifying annual operation, maintenance, and replacement (OM&R) expenditures needed to maintain performance of the water delivery system in Egypt. The delivery system, which includes the High Aswan Dam (HAD), large irrigation structures, pump stations, and thousands of canals and drains, is described. Procedures for estimating these OM&R costs and assessing system benefits in the various use sectors are presented. The article also explains the development and application of a cost allocation model to estimate the share of the various use sectors from the system cost.

14629. **Boadu, F.O. 1994.** Policy on private water sales in rural Ghana. Journal of Water Resources Planning and Management, 120(6):944-961.

*Water policy / Public sector / Private sector / Water distribution / Rural development / Water rates / Water market / Water costs / Ghana*  
(Location: HQ Call No: PER Record No: H 15590)

14630. **Boissevain, W.; Ceelen, J. 1993.** Expansion of irrigation service fee in Indonesia. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.383-399.

*Water rates / Cost recovery / Water users' associations / Farmer participation / Training / Sustainability / Indonesia*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15633)

14631. **Carruthers, I. 1994.** The economic case for sustainable irrigation development. In USAID. Asia and Near East Bureau, ISPAN, Future directions for implementing water policy. A workshop held at the University of Maryland University College Conference Center, Maryland, USA, 28-29 April 1994. 12p.

*Irrigation / Economic aspects / Investment planning*  
(Location: HQ Call No: 631.7.8 G000 USA Record No: H 14484)

14632. **Chambouleyron, J.; Bos, M.G. 1994.** Le budget des associations d'usagers de l'eau en fonction de leur taille, Mendoza, Argentine. [The budget of water users' associations as a function of size, Mendoza, Argentina] Grid, 5:8-9.

*Water costs / Water users' associations / Financing / Irrigation management / Argentina / Mendoza*  
(Location: HQ Call No: P 3613 Record No: H 15365)

14633. **Chaudhry, M.G.; Majid, S.A.; Chaudhry, G.M. 1993.** The policy of irrigation water pricing in Pakistan: Aims, assessment and needed redirections. The Pakistan Development Review, 32(4)Part II:809-821.

*Price policy / Water costs / Water rates / Irrigation water / Irrigated farming / Pakistan*  
(Location: HQ Call No: P 3507 Record No: H 14663)

14634. **Crane, R. 1994.** Water markets, market reform and the urban poor: Results from Jakarta, Indonesia. World Development, 22(1):71-83.

*Water supply / Water market / Indonesia / Jakarta*  
(Location: ODI Call No: ODI Journals Record No: I. 940425)

14635. Desai, C.M.; Jurriens, M. 1993. Financing operation and maintenance in India. In Jurriens, M.; Jain, K.P. (Eds.), Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands. New Delhi, India: ILRI/WALMI. pp.201-218.

*Maintenance / Financing / Water rates / Cost recovery / Water users' associations / Farmers' associations / India*

(Location: HQ Call No: 631.7.1 G635 JUR  
Record No: H 15146)

14636. Deurlloo, J.A.; Jurriens, M. 1993. Financing maintenance of water control systems in the Netherlands. In Jurriens, M.; Jain, K.P. (Eds.), Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands. New Delhi, India: ILRI/WALMI. pp.97-109.

*Irrigation canals / Maintenance / Water control / Economic aspects / Cost recovery / Water law / Institutions / Organizations / Netherlands / India*

(Location: HQ Call No: 631.7.1 G635 JUR  
Record No: H 15137)

14637. Dikshit, N.K.; Maheshwari, K.M. 1993. Funds for maintenance: Some basic issues in the Indian context. In Jurriens, M.; Jain, K.P. (Eds.), Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands. New Delhi, India: ILRI/WALMI. pp.179-183.

*Maintenance costs / Financing / Irrigation canals / Water rates / India*

(Location: HQ Call No: 631.7.1 G635 JUR  
Record No: H 15144)

14638. Gerards, J.L.M.H. 1994. Irrigation service fees (ISF) in Indonesia: Towards irrigation co-management with water users associations through contributions, voice, accountability, discipline and plain hard work. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Draft conference papers. Vol.1. pp.57-68.

*Water users' associations / Water costs / Cost recovery / Water policy / Irrigation management / Farmer participation / Indonesia*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15416)

14639. Gulati, A.; Svendsen, M.; Choudhury, N.R. 1994. Institutional reforms for better cost recovery in Indian irrigation. Paper prepared for IFPRI/ICAR Workshop on Agricultural Growth in India, New Delhi, India, 1-6 May 1994. 28p.

*Cost recovery / Institution building / Irrigation management / Farmer participation / India / Philippines / Korea Republic / USA / Indonesia*

(Location: HQ Call No: IIMI 631.7.4 G635 GUL  
Record No: H 14338)

14640. Gulati, A.; Svendsen, M.; Choudhury, N.R. 1994. Major and medium irrigation schemes: Towards better financial performance. Economic and Political Weekly, 29(26):A72-A79.

*Irrigation programs / Irrigation management / Financing / Cost recovery / Performance / Farmer participation / Irrigation efficiency / India*

(Location: HQ Call No: IIMI 631.7.4 G635 GUL  
Record No: H 14774)

14641. Gulati, A.; Svendsen, M.; Choudhury, N.R. 1994. Operation and maintenance costs of canal irrigation and their recovery in India. Paper prepared for IFPRI/ICAR Workshop on Agricultural Growth in India, New Delhi, India, 1-6 May 1994. 30p.

*Irrigation canals / Irrigation operation / Maintenance / Cost recovery / Policy / India*

(Location: HQ Call No: IIMI 631.7.4 G635 GUL  
Record No: H 14372)

14642. Gulati, A.; Svendsen, M. 1994. Towards financial autonomy of the irrigation sector: For better cost recovery and management (lessons from selected countries and selected states of India) IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Draft conference papers. Vol.1. pp.70-79.

*Cost recovery / Institution building / Irrigation management / Farmer participation / India / Philippines / China / Korea Republic / USA / Indonesia*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15417)

14643. Hafid, A.; Hayami, Y. 1979. Mobilizing local resources for irrigation development: The Subsidi Desa Case of Indonesia. In IRRI. Irrigation and Water Management Department, Background papers on social, economic, communication and institutional issues in irrigation water management. Vol.3. 18p.

*Irrigation management / Irrigation programs / Rehabilitation / Economic evaluation / Development policy / Resource management / Training / Case studies / Indonesia*

(Location: HQ Call No: P 3283 Record No: H 13803)

14644. IRRI. 1979. Background paper for Irrigation and Water Management Training Course: Evaluating the economic efficiency of irrigation investments. In IRRI. Irrigation and Water Management Department, Background papers on social, economic, communication and institutional issues in irrigation water management. Vol.3. 3p.

*Irrigation management / Costs / Crop production / Economic evaluation*

(Location: HQ Call No: P 3283 Record No: H 13801)

14645. **IRRI. 1979.** Background paper for Irrigation and Water Management Training Session II (E1) In IRRI. Irrigation and Water Management Department, Background papers on social, economic, communication and institutional issues in irrigation water management. Vol.3. 8p.

*Training / Farmers / Crop production / Economic aspects / Farm management / Costs*

(Location: HQ Call No: P 3283 Record No: H 13804)

14646. **IRRI. 1979.** Background paper for Irrigation and Water Management Training Session II - A: Some useful economic concepts. In IRRI. Irrigation and Water Management Department, Background papers on social, economic, communication and institutional issues in irrigation water management. Vol.3. 13p.

*Irrigation management / Water management / Water allocation / Economic aspects / Training / Farmers / Fertilizers / Crop yield*

(Location: HQ Call No: P 3283 Record No: H 13800)

14647. **IRRI. 1979.** Background paper for Irrigation and Water Management Training Course session II (D) Concepts of farm income, enterprise budgeting and returns to scarce resources. In IRRI. Irrigation and Water Management Department, Background papers on social, economic, communication and institutional issues in irrigation water management. Vol.3. 23p.

*Farm income / Costs / Returns / Economic evaluation / Irrigation management / Training*

(Location: HQ Call No: P 3283 Record No: H 13802)

14648. **Kloezen, W.H. 1994.** Changing pillows for a headache? Financing participatory irrigation management in Sri Lanka. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Draft conference papers. Vol.1. pp.93-106.

*Financing / Irrigation management / Participatory management / Farmer participation / Farmers' associations / Privatization / Legislation / Maintenance costs / Sri Lanka / Kadulla Irrigation Scheme*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15419)

14649. **Kyi, K.M. 1989.** Current thinking, policies and activities regarding the recovery of irrigation cost, particularly O&M costs, in various countries visited by the Management Specialist. In Kyi, K. M. Report on the trip to explore the possibilities of establishing a research/information network in irrigation finance or the recovery of irrigation cost in member countries of the ADB. 39p.

*Cost recovery / Irrigation management / Policy / Maintenance costs / Economic aspects / Water users' associations / Water rates / Non-governmental organizations / Malaysia / Thailand / Bangladesh / Indonesia*

(Location: HQ Call No: IIMI 631.7.4 G000 KYI Record No: H 13754)

14650. **Kyi, K.M. 1989.** Report on the trip to explore the possibilities of establishing a research/information network in irrigation finance or the recovery of irrigation cost in member countries of the ADB. Report on the needs and possibilities of networking in the recovery of irrigation cost in Malaysia, Thailand, Bangladesh, Indonesia and Sri Lanka, May 1989. 12p.

*Cost recovery / Research / Networks / Irrigation management / Irrigation systems / Financing / Economic aspects / Water users' associations / Farmer managed irrigation systems / Policy / Malaysia / Thailand / Bangladesh / Indonesia / Sri Lanka*

(Location: HQ Call No: IIMI 631.7.4 G000 KYI Record No: H 13753)

14651. **Lebaron, A.D. 1994.** Profitable small-scale sprinkler irrigation in Guatemala. Irrigation and Drainage Systems, 8(1):13-23.

*Sprinkler irrigation / Small scale systems / Economic aspects / Guatemala*

(Location: HQ Call No: PER Record No: H 15509)

14652. **Li, L.; Chen, X. 1994.** The financial sources for the development of small and medium-sized irrigation works. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.137-141.

*Small scale systems / Irrigation management / Financing / Farmer participation / Agricultural policy / Rural development / China*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15560)

14653. **Mailhol, J.C. 1994.** Méthode pour apprécier les chances de rentabiliser son matériel d'irrigation. ICID Bulletin, 43(1):37-52.

*Irrigation effects / Crop yield / Irrigation equipment / Models / France*

(Location: HQ Call No: PER Record No: H 15640)

**Abstract:** This paper proposes a simplified method for assessing whether a farmer can run his irrigation equipment profitably to produce a given crop in a given soil. Assessment is based on marginal costs, so structural changes of the farming system due to irrigation are not considered. The impact of irrigation on yield being the sole object of this investigation, the approach is better suited to study of plots. First one defines the random variable D as the damage suffered by a crop due to lack of irrigation. Statistical data are examined over n years, then the updated cost of damage over k years is computed (k can be related to the length of depreciation of the equipment). On the basis of different assumptions, we can thus



assess the profitability of "converting to irrigation." Examples specific to different regions of France, are given, and demonstrate, *ceteris paribus*, that different regions require different sizes of irrigated surface if equipment is to be operated profitably.

14654. **Maroteix, J. 1993.** Interet et cout de l'irrigation apres la reforme de la politique agricole commune. [Irrigation cost and profitability under the reformed common agricultural policy] ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-F, Question 45, R30-R49: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.567-574.

*Agricultural policy / Irrigation water / Costs / Farmers' attitudes / Social aspects*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15653)

14655. **Meinzen-Dick, R.; Sullins, M. 1994.** Water markets in Pakistan: Participation and productivity. Washington, DC, USA: IFPRI. iii, 68p. (EPTD discussion paper no.4)

*Water market / Irrigation water / Research / Policy / Groundwater / Tube wells / Agricultural production / Social aspects / Farmer participation / Pakistan / Punjab / Faisalabad / Dir*  
(Location: HQ Call No: P 3419 Record No: H 14423)

**Note:** Report of research completed under USAID Grant No.391-0492-G-00-1791-00 for the Ministry of Food and Agriculture, Pakistan.

14656. **Mian, S.H. 1991.** Water conservation for surface irrigation and its management in Potwar Plateau of Pakistan. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.31-45.

*Water conservation / Irrigation management / Crop yield / Dams / Case studies / Water users' associations / Pakistan / Potwar Plateau*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 14913)

14657. **Naugle, J. 1992.** Affordable water for irrigation: An experience in Niger. *Waterlines*, 11(1):28-31.

*Wells / Costs / Irrigation / Niger*  
(Location: ODI Call No: ODI Journals Record No: L 942457)

14658. **NIA; IIMI. Philippines. 1991.** A training manual on financial management system II. Vol. II. Quezon City, Philippines NIA. vi, 81p.

*Financial planning / Farmers' associations / Training / Management / Accounting*  
(Location: HQ Call No: IIMI 631.7.8 G732 NIA  
Record No: H 14233)

14659. **NIA; IIMI. Philippines. 1991.** A training manual on financial management system II. Vol.I. Quezon City, Philippines: NIA. vi, 193p.

*Financial planning / Farmers' associations / Training / Management / Accounting*  
(Location: HQ Call No: IIMI 631.7.8 G732 NIA  
Record No: H 14232)

14660. **Nie, D.; Tao, S. 1994.** Improvement of irrigation management and enhancement of economic benefits by contract management. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.35-37.

*Irrigation management / Contracts / Farmer participation / Water rates / Economic aspects / China*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15549)

14661. **Norman, W.R.; Sami, A. 1990.** Irrigation water costs among different Sahelian systems The case of Niger. ASAE Winter Meeting presentation, Chicago, IL, USA, 18-21 December, 1990. Paper no.902617. 28p.

*Irrigation water / Water costs / Irrigation systems / Performance / Energy / Farmers / Labor / Niger / Sahel*  
(Location: HQ Call No: P 3360 Record No: H 14175)

14662. **Palanisami, K.; Rosegrant, M.W. 1994.** Modeling irrigation investment priorities for future - Tamil Nadu, India. Paper prepared for IFPRI/ICAR Workshop on Agricultural Growth in India, New Delhi, India, 1-6 May 1994. 23p.

*Irrigated farming / Investment planning / Models / Deep tube wells / Tanks / India / Tamil Nadu*  
(Location: HQ Call No: 631.7.4 G656 PAL  
Record No: H 14374)

14663. **Qian, X. 1994.** Development of a diversified economy to increase financial revenue for irrigation management. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.295-301.

*Irrigation management / Water policy / Economic aspects / Constraints / China*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
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14728. **Howsam, P.; Kay, M.; Tyrrel, S.; Weatherhead, K. 1993.** Microbiology in irrigation and drainage-ignorance and significance. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.512-523.  
*Irrigation equipment / Irrigation engineering / Drainage / Biological control / Maintenance /*

*Rehabilitation / Water quality / Tube wells / Pipes / Water conveyance*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15224)

14729. **Hussain, G.; Helweg, O.J. 1994.** Effect of saline irrigation water on tree growth. *Journal of Irrigation and Drainage Engineering*, 120(5):970-978.

*Irrigation water / Salinity / Water quality / Plant growth / Soil properties / Saudi Arabia*

(Location: HQ Call No: PER Record No: H 15377)

14730. **IIMI. Pakistan. 1994.** Tenth progress report on managing irrigation systems to minimize waterlogging and salinity problems. Lahore, Pakistan IIMI. 51p.

*Waterlogging / Salinity control / Irrigation management / Farmers' associations / Water quality / Tube wells / Irrigation scheduling / GIS / Land reclamation / Databases / Pakistan*

(Location: HQ Call No: IIMI 631.7.5 G730 IIM Record No: H 14220)

14731. **Kenya. Ministry of Health. Malaria Control Programme. 1994.** Epidemiology of malaria in Kenya. *African Journal of Medical Practice*, 1(1):5-6.

*Malaria / Disease vectors / Public health / Waterborne diseases / Kenya*

(Location: HQ Call No: P 3553 Record No: H 14809)

14732. **Kijne, J.W. 1994.** Environmentally sound water management: Irrigation and the environment. In Awan, N.M.; Latif, M. (Comp.), *Environmental assessment and management of irrigation and drainage projects for sustained agricultural growth: Proceedings of the International Symposium held at Centre of Excellence in Water Resources Engineering, University of Engineering and Technology, Lahore, Pakistan, 24-28 October 1993*. Vol. 1. pp.14-48.

*Environmental policy / Sustainability / Water management / Irrigation management / Water quality / Salinity / Irrigation systems / Sodicty / Surface irrigation / Groundwater irrigation / Pakistan*

(Location: HQ Call No: 631.7.5 G730 AWA Record No: H 15397)

14733. **Kuhnt, G.; Franzle, O. 1993.** Assessment of pollution of groundwater by Atrazine. *Land Degradation & Rehabilitation*, 4(4):245-250.

*Pollution / Groundwater / Maize / Germany*

(Location: ODI Call No: ODI Journals Record No: L 941328)

14734. **Kuper, M.; van Waijjen, E.G. 1994.** Farmer irrigation practices and their impact on soil salinity in the Punjab, Pakistan: Is salinity here to stay? In IIMI. Pakistan. Tenth progress report on managing irrigation systems to minimize waterlogging and salinity problems. Lahore, Pakistan: IIMI. pp.40.

*Soil salinity / Farmers' attitudes / Irrigation practices / Irrigation management / Pakistan / Punjab*

(Location: HQ Call No: IIMI 631.7.5 G730 IIM Record No: H 14224)

14735. **Lawson, J.D.; Sambrook, H.T.; Solomon, D.J.; Weilding, G. 1993.** The Roadford Scheme: Minimizing environmental impact on affected catchments. In Currie, J.C.; Pepper, A.T. (Eds.), *Water and the environment*. Chichester, UK: Ellis Horwood. pp.396-408.

*Environmental effects / Catchment yield / Rivers / UK*

(Location: HQ Call No: 333.91 G000 CUR Record No: H 15024)

14736. **Mara, D.D. 1993.** Treating wastewater for re-use in irrigation. In Cartwright, A. (Ed.), *World agriculture 1994*. London, UK: Sterling Publications. pp.99-101.

*Waste waters / Water reuse / Water quality / Effluents*

(Location: HQ Call No: 630 G000 CAR Record No: H 14120)

14737. **Matzger, H.; Moench, M. 1994.** Ground water availability for drinking in Gujarat: Quantity, quality and health dimensions. *Economic and Political Weekly*, 29(13):A31-A41.

*Groundwater / Water quality / Pollution control / India / Gujarat*

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14738. **Mock, J.F. 1994.** Using the ICID environmental check-list. *ODU Bulletin*, 29:7-9.

*Environmental control / Environmental effects / Water development / Evaluation / Water resources / Irrigation effects / Project appraisal / Project planning*

(Location: HQ Call No: P 3408 Record No: H 14260)

14739. **Moonasingha, A.D. 1993.** The environmental impacts of Mahaweli River engineering and reservoir construction project. In Currie, J.C.; Pepper, A.T. (Eds.), *Water and the environment*. Chichester, UK: Ellis Horwood. pp.409-419.

*Environmental effects / Irrigation programs / River basin development / Reservoirs / Dams / Public health / Malaria / Sri Lanka / Mahaweli Project*

(Location: HQ Call No: 333.91 G000 CUR Record No: H 15025)

14740. **Moukolo, N. 1992.** Transport de matieres solides et en suspension dans les rivières du bassin du fleuve Congo. [Solute and solid transport over the Congo rivers watershed] *Bulletin de Liaison du Comité Interfricain d'Etudes Hydrauliques*, No.90 October:3-10.

*Watersheds / Waste waters / Central African Republic / Congo River*



- (Location: ODI Call No: ODI Journals Record No: L 942393)
14741. **Mukiama, T.K.; Mwangi, R.W. 1989.** Seasonal population changes and malaria transmission potential of *Anopheles pharoensis* and the minor anophelines in Mwea Irrigation Scheme, Kenya. *Acta Tropica*, 46(3):181-189.  
*Malaria / Waterborne diseases / Irrigation programs / Kenya*  
(Location: HQ Call No: P 3495 Record No: H 14638)
14742. **Mwangi, R.W.; Mukiama, T.K. 1992.** Irrigation scheme or mosquito hazard: A case study in Mwea Irrigation Scheme. *Hydrobiologia*, 232:19-22.  
*Irrigation programs / Environmental effects / Disease vectors / Waterborne diseases / Rice / Kenya*  
(Location: HQ Call No: P 3660 Record No: H 15600)
14743. **Mwendera, E.J. 1993.** Effects of land use practices on water quality in the Lilongwe Water Board catchment area. *Siphon*, 15:18-24.  
*Land use / Water quality / Catchment areas / Groundwater / Pollution / Malawi / Lilongwe*  
(Location: HQ Call No: P 2999 Record No: H 13726)
14744. **Nahal, I. 1994.** Environmental and socio-economic effects of irrigation schemes in the Arab Near East. *Desertification Control Bulletin*, 24:42-47.  
*Social aspects / Economic impact / Irrigation systems / Environment / Middle East*  
(Location: ODI Record No: L 941716)
14745. **Nishat, A.; Chowdhury, S.K. 1985.** Water quality: Problems and needs for integrated control in Bangladesh. Paper presented at the Regional Symposium on Water Resources Policy in Agro-Socio-Economic Development, Dhaka, Bangladesh, 4-8 August 1985. 20p.  
*Water quality / Water resources / Water pollution / Environment / Policy / Salinity / Bangladesh*  
(Location: HQ Call No: P 3279 Record No: H 13791)
14746. **Okelo, G.B.A. 1994.** Cerebral malaria - Its management. *African Journal of Medical Practice*, 1(1):11.  
*Malaria / Disease vectors / Public health / Waterborne diseases / Africa*  
(Location: HQ Call No: P 3553 Record No: H 14811)
14747. **Oster, J.D. 1994.** Irrigation with poor quality water. *Agricultural Water Management*, 25(3):271-297.  
*Irrigation water / Water quality / Salinity*  
(Location: HQ Call No: PER Record No: H 14969)
14748. **Pearce, G. 1993.** Assessment of environmental impacts from irrigation and drainage projects. In Zakaria, S. (Ed.), *Agricultural drainage Proceedings of the National Conference on Agricultural Drainage, Melaka, Malaysia, 9-12 February 1993. Melaka, Malaysia: MANCID. pp.2.35-2.49.*  
*Environmental effects / Drainage / Irrigation programs / Development projects / Assessment*  
(Location: HQ Call No: 631.62 G714 ZAK Record No: H 14714)  
**Abstract:** The paper discusses the growing need for improved assessment of the environmental impacts of irrigation and drainage projects, and links this to the need to make such projects more sustainable and less wasteful of resources. The ICID Environmental Check-list is recognized as a means of making progress in this respect. The need for improved communication between irrigation and drainage professionals is also noted. The IPTRID Networking initiative is a recent means of encouraging such interaction. It is likely that the use of the ICID check-list will also provide a means for such communication to increase.
14749. **Premalal, W.P.R. 1992.** A deterministic approach in prioritizing sub-watersheds for soil and water conservation: A case study in Hanguranketa, Sri Lanka. *Tropical Agricultural Research*, 4:308-314.  
*Watershed management / Water conservation / Soil conservation / Reservoirs / Remote sensing / Case studies / Computer software / GIS / Sri Lanka / Hanguranketa / Mahaweli Project*  
(Location: HQ Call No: P 3630 Record No: H 12642)
14750. **Ragusa, S.R.; de Zoysa, D.S.; Rengasamy, P. 1994.** The effect of microorganisms, salinity and turbidity on hydraulic conductivity of irrigation channel soil. *Irrigation Science*, 15(4):159-166.  
*Salinity / Seepage / Open channels / Soil salinity*  
(Location: HQ Call No: PER Record No: H 15696)
14751. **Rajappa, R.; Pal, K.; Sharma, A.; Sharma, A.K. 1994.** Environmental impact assessment for Subarnarekha Irrigation Project. *Water Resources Development*, 10(2):203-219.  
*Environmental effects / Reservoirs / Irrigation management / Irrigation programs / Development projects / River basins / Water resources development / India / Orissa*  
(Location: HQ, ODI Call No: PER Record No: H 14798)
14752. **Saeed, M. 1986.** The estimation of evapotranspiration by some equations under hot and arid conditions. In American Society of Agricultural Engineers, *Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.434-438.*  
*Evapotranspiration / Estimation / Arid zones / Saudi Arabia*  
(Location: HQ Call No: 631.4 G000 AME Record No: H 4571)

14753. **Saleemi, M.A. 1994.** Environmental assessment and management of irrigation and drainage scheme for sustainable agricultural growth. In Awan, N.M.; Latif, M. (Comp.), Environmental assessment and management of irrigation and drainage projects for sustained agricultural growth: Proceedings of the International Symposium held at Centre of Excellence in Water Resources Engineering, University of Engineering and Technology, Lahore, Pakistan, 24–28 October 1993. Vol.1. pp.63–76.

*Environmental effects / Water pollution / Water supply / Surface water / Groundwater / Water quality / Salinity / Irrigation management / Drainage / Assessment / Sustainable agriculture / Pakistan*

(Location: HQ Call No: 631.7.5 G730 AWA  
Record No: H 15399)

14754. **Sally, H. 1994.** L'eau et la gestion de l'irrigation. Article submitted to the FAO Representative in Burkina Faso for publication in connection with 14th World Food Day, 16 October 1994. 5p.

*Irrigation / Environment / Social aspects / Economic aspects / Burkina Faso / Africa*

(Location: HQ Call No: IIMI 631.7.5 G226 SAL  
Record No: H 11782)

14755. **Sally, H. 1994.** The role of irrigation in integrated floodplain management. Paper prepared for presentation to the 2nd Meeting of the Task Force on Sahelian Floodplains, IUCN, Niamey, Niger, 31 October – 2 November 1994. 8p.

*Irrigation management / Flood plains / Wetlands / Environment / Natural resources / Burkina Faso / Sahel*

(Location: HQ Call No: IIMI 631.7.5 G226 SAL  
Record No: H 11781)

14756. **Sally, L. (Comp.) 1993.** Zones Humides du Burkina Faso: Rapport de l'Atelier sur les Zones Humides du Burkina Faso, Ouagadougou, Burkina Faso, 30 Juin – 2 Juillet 1993. Rapport de synthese, Union Mondiale pour la Nature (UICN) 45p.

*Wetlands / Ecology / Hydrology / Environmental effects / Social aspects / Economic aspects / Pollution / Legislation / Burkina Faso*

(Location: HQ Call No: P 3299 Record No: H 13917)

14757. **Sarwar, B. 1994.** Irrigating good land to death. *Panoscope*, 39:6–7.

*Salinity / Waterlogging / Crops / Pakistan*

(Location: HQ Call No: P 3504 Record No: H 14655)

14758. **Shadid, S.A.; Jenkins, D.A. 1992.** Development of simulation systems for quick screening of soils against salinity and sodicity. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by

the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14–17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.607–614.

*Simulation models / Soil management / Salinity control / Pakistan / Saudi Arabia*

(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14441)

14759. **Sharma, V.P. 1986.** Intensive agriculture and its impact on vector-borne diseases. In Venkataraman, G.S. (Ed.), Plant protection in the year 2000 AD: Proceedings of the Seminar held at New Delhi, India, 20–22 December 1984. New Delhi, India: Indian National Science Academy. pp.205–208.

*Waterborne diseases / Disease vectors / Crop yield / Rice / Paddy fields / Malaria / India*

(Location: HQ Call No: P 3464 Record No: H 14602)

14760. **Shuval, H. 1994.** Wastewater recycling and reuse in water resources management under conditions of scarcity in the Middle East and Asia. In USAID. Asia and Near East Bureau; ISPAN, Future directions for implementing water policy. A workshop held at the University of Maryland University College Conference Center, Maryland, USA, 28–29 April 1994. 20p.

*Waste waters / Water reuse / Water resource management / Water scarcity / Water stress / Public health / Middle East / Asia*

(Location: HQ Call No: 631.7.8 G000 USA  
Record No: H 14483)

14761. **Skogerboe, G.V.; Aslam, M. 1994.** Basin planning framework for irrigation salinity management. In Awan, N.M.; Latif, M. (Comp.), Environmental assessment and management of irrigation and drainage projects for sustained agricultural growth: Proceedings of the International Symposium held at Centre of Excellence in Water Resources Engineering, University of Engineering and Technology, Lahore, Pakistan, 24–28 October 1993. Vol.1. pp.77–94.

*Salinity control / Soil moisture / Groundwater / Models / River basins / Irrigation management / Pakistan*

(Location: HQ Call No: 631.7.5 G730 AWA  
Record No: H 15400)

**Abstract:** A planning framework for developing best management practices for salinity management in a river basin is presented. For purposes of analysis, the basin is divided into subareas. First, an inflow-outflow analysis is undertaken that describes, in general, the mass balance flow of water and salts between all of the subareas within the basin. A salinity management model is used for the detailed analysis within each subarea. This model consists of: (1) hydro-salinity submodel; (2) soil moisture chemistry submodel; (3) groundwater salinity submodel. Finally,

cost-effectiveness analysis are undertaken, first of all for each subarea, which are then aggregated into a set of optimal cost effectiveness functions for the entire basin, that facilitates decision-making in establishing an appropriate basin-wide salinity management program.

14762. **Slootweg, R.; Keyzer, R. 1993.** Reducing schistosomiasis infection risks through improved drainage. *Irrigation and Drainage Systems*, 7(2):99-112.

*Drainage / Water management / Schistosomiasis / Waterborne diseases / Public health / West Africa / Cameroon*

(Location: HQ Call No: PER Record No: H 13682)

**Abstract:** The discharge of irrigation drainage water through a natural depression in the Benue valley of North Cameroon, has created a permanently flooded habitat for freshwater snails which transmit schistosomiasis. The risk of transmission of schistosomiasis for people living near this depression has considerably increased. In close cooperation and consultation with the local population the depression was reconstructed in order to destroy snail breeding sites and to use the available land and water for agriculture and fisheries. Results indicate that the availability of a manageable water supply is welcomed by the villagers, especially because it makes dry-season horticulture a more attractive and profitable endeavor. In addition the production of fish is appreciated because it provides a cheap additional source of protein for local consumption. Snail populations have dramatically decreased in numbers after the reconstruction of the depression, showing that an integrated approach to drainage problems can result in increased production while reducing health risks.

14763. **Smedema, B. 1994.** Monsoon waterlogging. Grid, 4:7.

*Waterlogging / Rain / Salinity / Drainage*

(Location: HQ Call No: P 3338 Record No: H 14024)

14764. **Snellen, W.B. 1993.** Environmental management for disease vector control in rural water resources development projects: Four case studies. In *FAO, Integrated rural water management: Proceedings of the Technical Consultation on Integrated Rural Water Management*, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.183-212.

*Disease vectors / Malaria / Schistosomiasis / Environmental control / Water resources / Rural development / Sanitation / Drainage / Irrigation / Case studies / Indonesia / Java / Zimbabwe*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14153)

14765. **Sornmani, S.; Harinasuta, C. 1988.** Disease hazards of irrigation schemes. *World Health Forum*, 9:254-257.

*Public health / Dams / Waterborne diseases / Environmental effects / Thailand*

(Location: HQ Call No: P 3425 Record No: H 14533)

14766. **Subramanian, A.; Gorriz, C. 1993.** Irrigation technologies for water use efficiency and environmental protection. In *FAO, Integrated rural water management: Proceedings of the Technical Consultation on Integrated Rural Water Management*, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.95-108.

*Irrigation / Technology / Environmental control / Water use efficiency / Sustainability / Development / Water quality / Research institutes / Maintenance / Drainage / Water reuse / Networks*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14145)

14767. **Takase, K. 1994.** Global environment and agricultural resources management (IV) With special emphasis on land degradation by salinization and soil erosion. Final paper of a four-year (1990-1993) study by the International Development Center of Japan (IDCJ), planned and financed by the Ministry of Agriculture, Forestry and Fisheries, Japan. 28p.

*Environmental effects / Salinity control / Erosion / Land resources / Sustainable agriculture / Irrigation management / Research institutes / Asia / Africa / Latin America / Pakistan / Egypt / Mexico*

(Location: HQ Call No: P 3588 Record No: H 15180)

14768. **Tanji, K.K. 1990.** Nature and extent of agricultural salinity. In *Tanji, K.K. (Ed.), Agricultural salinity assessment and management*. New York, NY, USA: ASCE. pp.1-17. (ASCE manuals and reports on engineering practice no.71)

*Soil salinity / Irrigated farming / Water quality / History / USA / California*

(Location: HQ Call No: P 3510 Record No: H 14666)

14769. **Teferi, G. 1992.** Sustainability in irrigated land use systems in Ethiopia. In *Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management*, Leuven, Belgium, 14-17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.635-644.

*Land use / Sustainability / Irrigation programs / Waterborne diseases / Water management / Policy / Salinity / Groundwater / Malaria / Schistosomiasis / Ethiopia*

(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14444)

14770. **van Schilfgaarde, J. 1990.** Irrigated agriculture: Is it sustainable? In Tanji, K.K. (Ed.), *Agricultural salinity assessment and management*. New York, NY, USA: ASCE. pp.584-594. (ASCE manuals and reports on engineering practice no.71)

*Salinity / Irrigated farming / Water quality / Drainage / USA / California*

(Location: HQ Call No: P 3511 Record No: H 14667)

14771. **van Schilfgaarde, J. 1994.** Irrigation - A blessing or a curse. *Agricultural Water Management*, 25(3):203-219.

*Environmental effects / Social aspects / Irrigation systems / Irrigation programs / Development policy / History / Pakistan / Sudan / Egypt / USA*

(Location: HQ Call No: PER Record No: H 14967)

14772. **van Walsum, P.E.V.; Joosten, J.H.J. 1994.** Quantification of local ecological effects in regional hydrologic modelling of bog reserves and surrounding agricultural lands. *Agricultural Water Management*, 25(1):45-55.

*Ecology / Hydrology / Models / Simulation / Wetlands / Drainage / Netherlands*

(Location: HQ Call No: PER Record No: H 14065)

**Abstract:** A bog reserve surrounded by agricultural lands can easily give rise to conflicts, especially if the subsoil has good water-transmitting properties. Hydrologic modelling can be used to quantify the linkage between water management in agricultural lands and bog hydrology. However, most studies stop short of translating hydrologic effects into ecological ones. This is mainly due to the difference in scale between the hydrologic modelling and the fine-scaled landscape patterns in nature reserves. We developed a down-scaling method that attempts to bridge this gap. We assumed that for permanent bog growth to be possible, the long-term average of the downward seepage must not exceed a certain critical value. The area where the critical value is not exceeded was called the "Potential Bog Area". A method was devised for estimating changes in the size of this area. Such changes are also considered to be indicative for areal changes of other rare vegetation types in moist habitats. The method is illustrated using results from a study of the Groote Peel bog reserve in The Netherlands.

14773. **Verhoef, H. 1993.** Rice cultivation and human diseases: The scope for rice ecosystem management for vector control. In Cartwright, A. (Ed.), *World agriculture 1994*. London, UK: Sterling Publications. pp.102-105.

*Rice / Vectors / Human diseases*

(Location: HQ Call No: 630 G000 CAR Record No: H 14121)

14774. **Wang, G.; Sun, Z. 1991.** Optimized utilization of water resources in Jintai irrigation area with MMLP method. In ICID, *The Special Technical Session Proceedings*, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.136-146.

*Water use / Water resources / Soil water relations / Soil salinity / Optimization methods / Models / Drainage / Groundwater / China*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14735)

14775. **Wolfson, L. 1994.** Supervising surface water: Reducing the strain on filtration. *Irrigation Journal*, 44(4):18-19,23.

*Surface water / Filtration / Irrigation water / Aquatic weeds / Water quality / USA*

(Location: HQ Call No: PER Record No: H 14971)

#### Main system management

14776. **Ankum, P. 1993.** Operation specifications of irrigation main systems. In ICID, *15th International Congress on Irrigation and Drainage*, The Hague, The Netherlands, 1993. Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.119-130.

*Water allocation / Irrigation systems / Farmer participation / Decision making / Water distribution / Water delivery*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15071)

14777. **Murray-Rust, D.H.; Vander Velde, E.J. 1993.** Hydraulic changes and economic impact of lining of secondary canals in Punjab, Pakistan. Paper presented at the Workshop on Canal Lining in Pakistan, Lahore, Pakistan, 18-21 October 1993. 24p.

*Hydraulics / Economic aspects / Canal linings / Irrigation management / Pakistan / Punjab*

(Location: HQ Call No: IIMI 631.7.6.3 G730 MUR Record No: H 3592)

14778. **Savenije, H.H.G. 1993.** A framework for analysis to enhance efficiency in agricultural and urban water use. In FAO, *Integrated rural water management. Proceedings of the Technical Consultation on Integrated Rural Water Management*, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.37-44.

*Water use efficiency / Water resource management / Sustainability / Water demand / Conferences*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14138)

#### Tertiary and on-farm management

14779. **1987.** FMIS Planning Workshop Proceedings (24-26 June 1987) No.2:16-20.

*Farmer managed irrigation systems*

(Location: HQ Call No: PER Record No: H 2342)

14780. **Funnell, D.C. 1994.** Intervention and indigenous management: The geography of small-scale irrigation development in Morocco and Swaziland. Land Use Policy, 11(1):45-54.

*Small scale systems / Farmer managed irrigation systems / Traditional farming / Appropriate technology / Land tenure / Morocco / Swaziland*

(Location: ODI Call No: ODI Journals Record No: L 942156)

14781. **Hukkeri, S.B.; Pai, A.A. 1980.** On-farm management of water in irrigated areas. Paper discussed at the Task Force Meeting on On-Farm Management of Water in Irrigated and Rainfed Areas, Planning Commission on 5th June, 1980, New Delhi, India. 11p.

*Water management / Farmers / Water distribution / Water use efficiency / Maintenance / Training / India*

(Location: HQ Call No: P 3281 Record No: H 13793)

14782. **Jairath, J. 1985.** Technical and institutional factors in utilisation of irrigation: A case study of public canals in Punjab. Economic and Political Weekly, 20(13)A2-A10.

*Canal irrigation / Water loss / Irrigated farming / Maintenance / Water delivery / India / Punjab*

(Location: HQ Call No: P 3477 Record No: H 14615)

14783. **Merrey, D.J. 1992.** Irrigation and honor: Cultural impediments to the improvement of local level water management in Punjab, Pakistan. In Dove, M.R.; Carpenter, C. (Eds.), Sociology of natural resources in Pakistan and adjoining countries. Lahore, Pakistan: Vanguard Books. pp.126-160.

*Irrigation management / Rural sociology / Culture / Social organization / Case studies / Irrigation canals / Rehabilitation / Watercourses / Maintenance / Villages / Farmers' attitudes / Pakistan / Punjab*

(Location: HQ Call No: 333.7 G730 DOV Record No: H 14107)

14784. **Nagabrahmam, D. 1994.** Farmers' organisation for irrigation management: Some experiences from the Mahi Kadana Project Gujarat. In Sivamohan, M.V.K.; Scott, C.A. (Eds.), India: Irrigation management partnerships. Hyderabad, India: Booklinks Corporation. pp.107-121.

*Farmer managed irrigation systems / Farmers' associations / Irrigation management / Farmers' attitudes / Irrigation programs / India / Gujarat*

(Location: HQ Call No: 631.7.8 G635 SIV Record No: H 14990)

14785. **Oliemans, W.; Zitgerman, E. 1992.** Land and water use programme: Policy paper on small irrigation

systems. NWFP, Pakistan; Netherlands PATA; NWFP Department of Planning and Development; Netherlands Directorate-General for International Development Co-Operation. 61p. (PATA publication 90)

*Small scale systems / Land use / Water use / Irrigation*

(Location: ODI Call No: I 195. RRMG Record No: L I 195)

14786. **Ostrom, E.; Lam, W.F.; Lee, M. 1994.** The performance of self-governing irrigation systems in Nepal. Workshop in Political Theory and Policy Analysis, Indiana University, Indiana, USA. 33p.

*Farmer managed irrigation systems / Technology / Nepal*

(Location: HQ Call No: P 3351 Record No: H 14166)

**Abstract:** Current theories of development are predominantly based on the presumption that the obstacles and temptations involved in the local collective-action problems related to the provision and maintenance of CPRs are so substantial that only national governments have the capacity to surmount them. The temptation to free ride that underlies collective-action problems is viewed as a major deterrent to development. Because each villager would be better off if everyone else contributed to the provision of joint benefits available to all in the village, whether any particular villager contributed or not, it is presumed that villagers will not contribute. The difficulty of sustaining collective action over the long term, where contributions are obviously costly and benefits are both hard to measure and dispersed over time and space, deepens the pessimism about the likelihood of success of self-organized efforts. The presumed inability of individuals to undertake their own collective action is used as the foundation for a theory of governance that expounds the need for the State. And yet, farmer-managed irrigation systems in Nepal tend to achieve average performance levels above those operated by the State. This paper explores the puzzle raised by the anomaly of low-tech systems organized by farmers achieving higher levels of performance than the high-tech systems built largely with donor funding and operated by the Nepal Department of Irrigation.

14787. **Pande, U.C. 1994.** Farmer managed irrigation in the Uttar Pradesh hills: Consequences of water rights devolution. In Sivamohan, M.V.K.; Scott, C.A. (Eds.), India: Irrigation management partnerships. Hyderabad, India: Booklinks Corporation. pp.289-308.

*Farmer managed irrigation systems / Water rights / Legislation / Water distribution / India / Uttar Pradesh*

(Location: HQ Call No: 631.7.8 G635 SIV Record No: H 14999)

14788. **Pant, N. 1992.** Irrigation and agricultural development: In a CADA. Delhi, India: Ashish Publishing House. xvi, 132p.

*Irrigation programs / Agricultural development / Agricultural production / Agricultural extension / Constraints / Evaluation / Farmer participation / On farm research / Water distribution / Canals / India / Uttar Pradesh*

(Location: HQ Call No: 631.7.6.2 G635 PAN Record No: H 13712)

14789. **Tiffen, M.; Toulmin, C. 1986.** Water management on the Nyanyadzi scheme: Farmer attitudes and farm management practice. Analysis of 1986 census results on Nyanyadzi and recommendations on sample design. 20p.

*Farmers' attitudes / Water management / Methodology / Surveys / Zimbabwe / Nyanyadzi*

(Location: ODI Call No: I 199. RRMG Record No: L I 199)

14790. **Turner, B. 1994.** Small-scale irrigation in developing countries. Land Use Policy, 11(4):251-261.

*Small scale systems / Farmer managed irrigation systems / Developing countries / Water shortage / Water use / Conflict*

(Location: HQ, ODI Call No: P 3595 Record No: H 15277)

14791. **Unitas - Yunta. (Coordinating Committee) 1991.** Informe seminario - taller del Valles, Cochabamba, 29 al 31 de julio, 1991. [Seminar paper - Valles workshop, Cochabamba, 29-31 July 1991] Workshop held under the auspices of CIIR, organized by Comité Nacional de Defensa de la Vida del Campesinado. 28p. (Seminarios: Microriego y producción agropecuaria en Bolivia, informe no.71 [Seminars: Microirrigation and livestock production in Bolivia, paper no.71])

*Conferences / Animal production / Small scale systems / Irrigation / Bolivia / Valles*

(Location: ODI Call No: 6904. RRMG Record No: L 6904)

14792. **Unitas - Yunta. (Coordinating Committee) 1991.** Informe y resumen - Altiplano, Valles y Chaco. [Paper and summary - Altiplano, Valles y Chaco] Workshop held under the auspices of CIIR, organized by Comité Nacional de Defensa de la Vida del Campesinado. 8p. (Seminarios: Microriego y producción agropecuaria en Bolivia, informe no.72 [Seminars: Microirrigation and livestock production in Bolivia, paper no.72])

*Conferences / Animal production / Small scale systems / Irrigation / Bolivia / Altiplano / Valles / Chaco*

(Location: ODI Call No: 6903. RRMG Record No: L 6903)

14793. **Unitas - Yunta. (Coordinating Committee) 1991.** Informe seminario - taller del altiplano, 17 al 19 de julio 1991. [Seminar paper - Altiplano workshop, 17-19 July 1991] Held under the auspices of CIIR, organized by

Comité Nacional de Defensa de la Vida del Campesinado. 37p. (Seminarios: Microriego y producción agropecuaria en Bolivia, informe no.70 [Seminars: Microirrigation and livestock production in Bolivia, paper no.70])

*Conferences / Animal production / Small scale systems / Irrigation / Bolivia / Altiplano*

(Location: ODI Call No: 6905. RRMG Record No: L 6905)

#### Groundwater management

14794. **Abhayaratna, M.D.C.; Vermillion, D.; Johnson, S.; Perry, C. (Eds.) 1994.** Farmer management of groundwater irrigation in Asia. Selected papers from a South Asian Regional Workshop on Groundwater Farmer-Managed Irrigation Systems and Sustainable Groundwater Management, held in Dhaka, Bangladesh from 18 to 21 May 1992. Colombo, Sri Lanka: IIMI. ix, 205p.

*Farmer managed irrigation systems / Groundwater management / Conjunctive use / Tube well irrigation / Sustainability / Social aspects / Economic aspects / Aquifers / Agricultural development / Small scale systems / Case studies / Surface irrigation / Sprinkler irrigation / Water users' associations / Asia / Bangladesh / China / India / Indonesia / Nepal / Philippines / Sri Lanka*

(Location: HQ Call No: IIMI 631.7.6.3 G570 ABH Record No: H 15148)

14795. **Ahlfeld, D.P.; Islam, M.S. 1994.** Estimating the probability of exceeding groundwater quality standards. Water Resources Bulletin, 30(4):623-629.

*Groundwater / Water quality / Simulation models*

(Location: HQ Call No: PER Record No: H 15676)

14796. **Alnaggar, D. 1991.** Management of groundwater table and control of water logging and salinity in Fayoum depression. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.192-203.

*Waterlogging / Salinity / Groundwater / Water table / Drainage / Design / Egypt / Fayoum*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14927)

14797. **Aung Myo, U. 1994.** Improved operation and maintenance of lift irrigation systems and management of groundwater resources in Myanmar. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.185-191.

*Groundwater management / Groundwater irrigation / Water lifting / Low lift irrigation / Pumping / Myanmar*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14874)

14798. **Avon, L.; Durbin, T.J. 1994.** Evaluation of the Maxey-Eakin method for estimating recharge to groundwater-basins in Nevada. *Water Resources Bulletin*, 30(1):99-111.  
*Groundwater / Recharge / Infiltration / Evapotranspiration / Water budget / USA / Nevada*  
(Location: HQ Call No: PER Record No: H 14281)
14799. **Bagtzoglou, A.C.; Khan, M.N.; Guymon, G.L.; Thornton, J.R. 1993.** Groundwater quality management of a low inertia basin: Application to the San Mateo Basin, California. *Water Resources Management*, 7(3):189-205.  
*Groundwater management / Water quality / Simulation models / Mathematical models / Aquifers / Calibrations / USA / California*  
(Location: HQ Call No: PER Record No: H 4763)  
**Abstract:** A two-dimensional finite element model is applied to the San Mateo Basin, California in order to investigate feasible and efficient management alternatives to enhance the basin yield and preserve the basin water quality. The model utilizes lumped approximation methods for the determination of its subsurface boundary conditions, and incorporates a variety of hydrological processes. The model solves uncoupled flow and transport equations using a nodal domain integration technique for the flow model and an integrated finite difference method for the transport model. The model incorporates the basin inputs and outputs as ocean flux, well and phreatophyte extractions, subsurface inflow, precipitation and streambed percolation. Modeling results indicate that the sustained yield may be maximized by interception of ocean outflow from the basin. An improvement of about four times of the historical sustained yield was achieved. This strategy required relocation of existing wastewater recharge ponds and increasing basin extractions. In order to intercept most of the ocean outflow by increasing basin extractions, simulated subsurface seawater intrusion was observed. The water quality study indicated that the basin yield could be increased significantly by moderately relaxing the water quality criteria near the ocean.
14800. **Baker, N.T. 1993.** Utilization of a Geographic Information System to identify the primary aquifer providing ground water to individual wells in Eastern Arkansas. *Water Resources Bulletin*, 29(3):445-448.  
*GIS / Groundwater / Aquifers / Wells / USA / Arkansas*  
(Location: HQ Call No: PER Record No: H 13766)
14801. **Batchelor, C.H.; Lovell, C.J.; Semple, A.J. 1994.** Garden irrigation for improving agricultural sustainability in dryland areas. *Land Use Policy*, 11(4):286-293.  
*Sustainable agriculture / Groundwater irrigation / Groundwater extraction / Aquifers / Wells / Small scale systems / Water use efficiency / Gardening / Africa South of Sahara / Zimbabwe / Malawi / Sri Lanka*  
(Location: HQ, ODI Call No: P 3595 Record No: H 15280)
14802. **Ben-Jemaa, F.; Mariño, M.A.; Loaiciga, H.A. 1994.** Multivariate geostatistical design of ground-water monitoring networks. *Journal of Water Resources Planning and Management*, 120(4):505-522.  
*Groundwater management / Mathematical models / Monitoring / Networks / Design*  
(Location: HQ Call No: PER Record No: H 14789)
14803. **Carter, R.C.; Howsam, P. 1994.** Sustainable use of groundwater for small-scale irrigation: With special reference to Sub-Saharan Africa. *Land Use Policy*, 11(4):275-285.  
*Groundwater irrigation / Groundwater management / Groundwater extraction / Monitoring / Small scale systems / Legislation / Sustainability/ Policy / Africa South of Sahara*  
(Location: HQ, ODI Call No: P 3595 Record No: H 15279)
14804. **Castaneda, A.R.; Bhuiyan, S.I. 1991.** Nitrate-nitrogen concentrations in shallow groundwater underneath ricefields. *Philippine Journal of Crop Science*, 16(2):57-62.  
*Groundwater / Water quality / Rice / Paddy fields / Nitrogen / Fertilizers / Philippines*  
(Location: HQ Call No: P 3414 Record No: H 14297)
14805. **Charukalas, B. 1994.** Management of groundwater resources in Thailand. In *FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation*, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.242-248.  
*Groundwater management / Water resources / Thailand*  
(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14882)
14806. **Chawla, A.S.; Mall, A.N. 1981.** Analysis of water supply wells in hilly regions of Uttar Pradesh. *Journal of Indian Water Resources Society*, 1(3):33-39.  
*Water supply / Wells / India / Uttar Pradesh*  
(Location: ODI Call No: ODI Journals Record No: L 942446)
14807. **de la Cruz, S.; Peña, E. 1994.** Method to improve water resources management in groundwater pumping areas and a case study. *Water Resources Development*, 10(3):329-337.  
*Groundwater extraction / Pumping / Groundwater management / Gravity flow / Models / Irrigation*

*equipment / Case studies / Aquifers / Recharge / Mexico*

(Location: HQ Call No: PER Record No: H 15473)

**Abstract:** This paper describes the methodology used to obtain and analyse information concerning the operating conditions of wells, pumping equipment and irrigation systems to develop a sustainable groundwater management programme. A case study is provided to exemplify how the method was applied to attain a balance between the abstraction of groundwater for irrigation and the natural recharge of the aquifer.

14808. **Djuhaeri, S. 1994.** Management of groundwater resources and improved operation and maintenance of lift irrigation systems in Indonesia. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.167-171.

*Groundwater management / Water lifting / Irrigation operation / Maintenance / Water users' associations / Indonesia*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14871)

14809. **Dumandan, G.S. 1994.** Management of groundwater resources in the Philippines. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.214-222.

*Groundwater management / Groundwater irrigation / Water resources / Statistics / Philippines*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14877)

14810. **Dutta, D.K. 1989.** Ground water development. Journal of Indian Water Resources Society, 9(2):60-62.

*Groundwater development / Groundwater potential / Statistics / India*

(Location: HQ Call No: P 3287 Record No: H 13844)

14811. **FAO. 1994.** Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of the Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand FAO. 267p. (RAPA publication 1994/5)

*Groundwater management / Groundwater irrigation / Water lifting / Conferences / Developing countries / Pumping / Low lift irrigation / Maintenance / Irrigation operation / Tube wells / Asia / Pacific Islands / West Africa / Bangladesh / China / India / Indonesia / Korea*

*Republic / Myanmar / Pakistan / Philippines / Sri Lanka / Thailand / Vietnam*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14858)

14812. **Flockhart, D.E.; Sham, C.H.; Xiao, Y. 1993.** Maximizing the value of information for ground water protection: Three test cases. Water Resources Bulletin, 29(6):957-964.

*Groundwater / GIS / Decision support tools / USA / New York / Massachusetts*

(Location: HQ Call No: PER Record No: H 14508)

14813. **Flores, V.S.; Mejia, A.M. 1994.** Farmer-managed pump irrigation systems: A case study of Guimba-Cuyapo Network in the Philippines. In Abhayaratna, M.D.C.; Vermillion, D.; Johnson, S.; Perry, C. (Eds.), Farmer management of groundwater irrigation in Asia: Selected papers from a South Asian Regional Workshop on Groundwater Farmer-Managed Irrigation Systems and Sustainable Groundwater Management, held in Dhaka, Bangladesh from 18 to 21 May 1992. Colombo, Sri Lanka: IIMI. pp.181-195.

*Farmer managed irrigation systems / Pumping / Case studies / Philippines*

(Location: HQ Call No: IIMI 631.7.6.3 G570 ABH Record No: H 15152)

14814. **Gupta, A.D. 1989.** Modelling of groundwater overdraft and associated adverse consequences. In AIT, Water 30: A commemorative publication on the 30th anniversary of the Division of Water Resources Engineering, Asian Institute of Technology, Bangkok, Thailand, December 1989. Bangkok, Thailand: AIT. pp.119-140.

*Groundwater / Mathematical models / Thailand / Bangkok*

(Location: HQ Call No: 551.48 G000 AIT Record No: H 13783)

14815. **Gupta, A.D. 1990.** Modelling of groundwater overdraft and related environmental consequences. In Biswas, A.K.; Khoshoo, T.N.; Khosla, A. (Eds.), Environmental modelling for developing countries. London, UK: Tycooly Publishing. pp.84-119.

*Groundwater management / Groundwater development / Environmental effects / Salt water intrusion / Mathematical models / Thailand / Bangkok*

(Location: HQ Call No: 333.7 G000 BIS Record No: H 13694)

14816. **Haozhi, L. 1991.** Recharge of ground water for well irrigation in the Yellow River Basin. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. pp.106-112.

*Groundwater / Recharge / Wells / Surface water / Conjunctive use / Irrigation requirements / River basins / China*



(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 14893)

14817. **Huntoon, P.W. 1993.** Hydrogeologic characteristics and deforestation of the stone forest karst aquifers of South China. *Water Resources Journal*, 176:65-72.

*Groundwater management / Aquifers / Environmental effects / Deforestation / Rain / China*

(Location: HQ Call No: PER Record No: H 14055)

**Abstract:** Stone forest aquifers comprise an important class of shallow, unconfined karstic aquifers in the South China karst belt. They occur under flat areas such as floors of karst depressions, stream valleys, and karst plains. The frameworks for the aquifers are the undissolved carbonate spires and ribs in epikarst zones developed on carbonate strata. The groundwater occurs within clastic sediments which infill the dissolution voids. The aquifers are thin, generally less than 100 m-thick, and are characterized by large lateral permeabilities and small storage. The result is that the aquifers are difficult to manage because recharge during the rainy season moves rapidly out of the aquifers. Water levels fall sharply as the dry season progresses and the groundwater supply falls off accordingly. The magnitude and duration of the seasonal recharge pulse that replenishes the stone forest aquifers have been severely impacted by massive post-1958 deforestation in the south China karst region. Water that was formerly retained beyond the wet season in the forested uplands, later to be released to the stone forest aquifers under the lowland plains, now passes quickly through the system during the wet season. The loss of this seasonal upland storage has resulted in both a reduction in the volume of recharge to the lowland stone forest aquifers and a shortening of the seasonal recharge event. The result is accelerated water-level declines in the stone forest aquifers as the dry season progresses which, in turn, causes premature dewatering of wells and decreased spring discharges. This response is compounded by increased groundwater withdrawals as the people attempt to offset the declining supply. Management of the total water-supply system requires not only tinkering with the aquifer, but massive reforestation efforts to restore dry season water retention in the upland parts of the watersheds.

14818. **Jairath, J. 1985.** Private tubewell utilisation in Punjab: A study of cost and efficiency. *Economic and Political Weekly*, 20(40):1703-1705;1707-1712.

*Tube well irrigation / Operating costs / Private ownership / India / Punjab*

(Location: HQ Call No: P 3413 Record No: H 14293)

14819. **Joung-Mo, L. 1994.** Management of groundwater resources in South Korea. In *FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation*, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.178-184.

*Groundwater management / Groundwater irrigation / Water resources / Water law / Korea Republic*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14873)

14820. **Kacimov, A.R. 1993.** Estimation and optimization of transient seepage with free surface. *Journal of Irrigation and Drainage Engineering*, 119(6):1014-1025.

*Groundwater / Seepage / Water table*

(Location: HQ Call No: PER Record No: H 13675)

**Abstract:** Single sink depths providing maximum ground-water table decrease during a fixed time interval within a selected area are found for the 2-D and 3-D cases. The curve of the maximal phreatic surface position (underflooding curve) in the aquifer from flood induced variation in water level of the ground-water reservoir is calculated. Well-known analytical solutions based on nonlinear and linear potential theories and the Dupuit-Forchheimer approximation are applied to calculate the objective function, decision variables, and boundary of the fully saturated zone. In the linear case, an explicit analytic solution gives the unique maximum of the water table decrease at the compliance point for a given pumping duration. For small values of sink depth, the linear approach is invalid. In the nonlinear case, complex analysis and series expansions are used. For small values of drain depth, the series technique becomes untenable. For reservoir-aquifer problem the spreading phreatic surface is a rotating straight line and the under-flooding curve is a parabola.

14821. **Kahlow, M.A.; Hamilton, J.R. 1994.** Status and prospects of karez irrigation. *Water Resources Bulletin*, 30(1):125-134.

*Tube well irrigation / Water management / Channel improvement / Water users / Cropping systems / Water loss / Pakistan / Balochistan*

(Location: HQ Call No: PER Record No: H 14283)

14822. **Kahnert, F. 1989.** Assisting poor rural areas through groundwater irrigation: Exploratory proposals for East India, Bangladesh and Nepal. ii, 53p. + annexes. (World Bank internal discussion paper/Asia regional series report no.IDP 44)

*Groundwater irrigation / Poverty / Aquifers / Surface water / Rural development / Development aid / Tube wells / Water market / Policy / Research*

*priorities / Social aspects / India / Bangladesh / Nepal*

(Location: HQ Call No: 631.7.6.3 G570 KAH  
Record No: H 13972)

14823. Khan, H.R. 1994. Management of groundwater resources for irrigation in Bangladesh. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.92-111.

*Groundwater irrigation / Groundwater management / Pumping / Bangladesh*

(Location: HQ Call No: 631.7.6.3 G750 FAO  
Record No: H 14864)

14824. Kunz, H. 1993. Impact of drainage on the ground water of inner tidal regions. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1123-1133.

*Drainage / Groundwater / Salinity / Sandy soils / Germany*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15344)

14825. Labedzki, L. 1993. Analysis of the optimum groundwater table depths for designing subirrigation systems. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.621-626.

*Groundwater / Water table / Irrigation design / Soil water / Simulation / Computer techniques*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15232)

14826. Lawrence, A.R. 1992. Report on a visit to India, 25 October to 5 November 1992. Wallingford, UK: British Geological Survey. 12p. (Technical report, hydrogeology series no WD/92/47R)

*Wells / Aquifers / Groundwater / Monitoring / Methodology / India / Maharashtra*

(Location: ODI Call No: I 205. RRMG Record No: L 943090)

14827. Lennaerts, A.B.M.; Simonffy, Z. 1993. Groundwater protection in Hungary. Land and Water International, 78:17-20.

*Groundwater / Water supply / Water conservation / Hungary*

(Location: HQ Call No: P 2977 Record No: H 13668)

14828. Lerner, D.N.; Tellam, J.H. 1993. The protection of urban groundwater from pollution. In Currie, J.C.; Pep-

per, A.T. (Eds.), Water and the environment. Chichester, UK: Ellis Horwood. pp.322-335.

*Groundwater management / Water pollution / Water quality / Aquifers / Legislation / UK / India / Birmingham / Madras*

(Location: HQ Call No: 333.91 G000 CUR  
Record No: H 15020)

14829. Lunzhang, S. 1994. Management of groundwater resources in China. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September-1 October 1993. Bangkok, Thailand: FAO. pp.119-127.

*Groundwater management / Water resources / Water use / Tube wells / China*

(Location: HQ Call No: 631.7.6.3 G750 FAO  
Record No: H 14868)

14830. McEntire, J. 1989. Water farms and transfer conflicts in Arizona, USA: A proposed resolution process. Environmental Management, 13(3):287-295.

*Groundwater management / Legislation / Equity / Water policy / Water transfer / USA / Arizona*

(Location: HQ Call No: P 3602 Record No: H 15290)

14831. Mioduszeowski, W. 1992. Regulation of water condition on the Peatland Jegrznia. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.429-437.

*Soil moisture / Groundwater / Soil water / Poland*

(Location: HQ Call No: 631.7.1 G000 FEY

Record No: H 14371)

**Abstract:** The calculations of groundwater level on the peatland Jegrznia are presented. The purpose of the study was to find the possibility of maintaining higher moisture content of the peat during the summer season. It should stop mineralization and degradation of the peat soil. The study has shown that the lowering of groundwater on this area during summer depends mainly on evapotranspiration. Therefore maintaining high water level in the rivers and the canal will not protect from lowering groundwater and drying of the peat in the central part of the study area. It is necessary to cause the flood at least during spring and if it is possible during summer as well. The flooding of the area may stop the degradation of the peat, but some problems with agricultural utilization of this land will appear.

14832. Moench, M. 1994. Approaches to ground water management: To control or enable? Economic and Political Weekly, September 24:A135-A146.

*Groundwater management / Water law / Water rights / India / USA*

(Location: HQ Call No: P 3626 Record No: H 12943)

14833. Moench, M. 1991. Drawing down the buffer: Upcoming ground water management issues in India. Berkeley, CA, USA: Pacific Institute for Studies in Development, Environment, and Security. 18p.

*Groundwater management / Groundwater potential / Recharge / Water balance / Water resources / Wells / Policy / India*

(Location: HQ Call No: 631.7.6.3 G635 MOE Record No: H 15187)

14834. Moench, M. 1991. Social issues in Western U.S. groundwater management: An overview. Berkeley, CA, USA: Pacific Institute for Studies in Development, Environment, and Security. 39p.

*Groundwater management / Water rights / Costs / Drought / Case studies / USA*

(Location: HQ Call No: 631.7.6.3 G430 MOE Record No: H 15188)

14835. Moshabbir, P.M.; Khan, S. 1994. Management of groundwater resources in Pakistan. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September-1 October 1993. Bangkok, Thailand: FAO. pp.197-202.

*Groundwater management / Pumping / Tube wells / Water table / Pakistan*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14875)

14836. Munasinghe, M. 1991. Groundwater resource management and environmental protection: A case study of the Philippines. Natural Resources Forum, 15(4):302-312.

*Groundwater management / Environmental control / Water resource management / Aquifers / Models / Policy / Water rates / Case studies / Philippines*

(Location: HQ Call No: P 3603 Record No: H 15291)

14837. Nachtnebel, H.P.; Kovar, K.; Zuidema, Z. (Eds.) 1993. Hydrological basis of ecologically sound management of soil and groundwater: Report of the UNESCO-ICGW Working Group to IHP Project M-3-1. Paris, France: UNESCO. 71p. (Technical documents in hydrology)

*Groundwater management / Soil management / Hydrology / Ecology / Models / Monitoring*

(Location: HQ Call No: 631.7.6.3 G000 NAC Record No: H 14308)

14838. Narayanamoorthy, A. 1993. Competition for bore-well water and its impact on tank: Some observations. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-F, Question 45, R30-R49: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.557-566.

*Wells / Costs / Tank irrigation / Villages / Water users' associations / History / Water distribution / Tube well irrigation / Farmers' attitudes / India*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15652)

14839. Natarajan, U.; Rajagopal, R. 1994. Economics of screening for pesticides in ground water. Water Resources Bulletin, 30(4):579-588.

*Groundwater / Pesticide residues / Water pollution / Water quality / Monitoring / USA*

(Location: HQ Call No: PER Record No: H 15672)

14840. Nazimuddin, M.; Rajagopalan, S.P.; Basak, P. 1991. Farmer managed dug well based irrigation in the minor irrigation sector: A case study in India. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.347-354.

*Wells / Farmer managed irrigation systems / India / Kerala*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14940)

14841. Owen, M. 1993. Groundwater abstraction and river flows. In Currie, J.C.; Pepper, A.T. (Eds.), Water and the environment. Chichester, UK: Ellis Horwood. pp.312-321.

*Groundwater extraction / Groundwater development / Rivers / Water resources / Legislation / UK*

(Location: HQ Call No: 333.91 G000 CUR Record No: H 15019)

14842. Peralta, R.C.; Kowalski, K.G. 1986. Optimizing the rapid evolution of target groundwater potentiometric surfaces. In American Society of Agricultural Engineers, Transactions of the ASAE: Special edition - Soil and Water, Vol.29. St. Joseph, MI, USA: ASAE. pp.940-947.

*Groundwater management / Aquifers / Pumping / Mathematical models*

(Location: HQ Call No: 631.4 G000 AME Record No: H 13853)

14843. Prasad, R.K.; Sarkar, T.K. 1994. Management of groundwater resources in India. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.144-166.

*Groundwater management / Groundwater irrigation / Water lifting / Legislation / Water resources / Water use / India*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14870)

14844. **Ratzlaff, S.A.; Aral, M.M.; Al-Khayyal, F. 1993.** Optimal design of groundwater capture systems using segmental velocity-direction constraints. *Water Resources Journal*, 176:73-79.

*Groundwater extraction / Wells / Mathematical models / Optimization*

(Location: HQ Call No: PER Record No: H 14056)

**Abstract:** An effective means of containing contaminant plumes in regional aquifers is to regulate the groundwater flow through extraction wells that are strategically located. In this paper, the best well locations and flow rates are determined using numerical groundwater simulation and optimization techniques. As a first step in the analysis, the methodology utilizes a novel idea of delineating the capture zone by imposing segmental implicit velocity-direction constraints as opposed to explicit and unilateral velocity-direction constraints which have been proposed by others. The optimization problem that arises is a mixed-integer linear programme which is solved by standard branch and bound techniques. The overall procedure is illustrated on representative example problems.

14845. **Rosin, R.T. 1993.** The tradition of groundwater irrigation in Northwestern India. *Human Ecology*, 21(1):51-86.

*Groundwater irrigation / Water resources / History / Hydrology / India / Rajasthan*

(Location: HQ Call No: P 3290 Record No: H 13883)

**Abstract:** Ethnographic research in the central Aravalli Hills of Rajasthan documents a coherent system of groundwater irrigation distinctively different from the system of dams, weirs, and perennial canals redesigned for India by the British during the early nineteenth century and continued by contemporary Indian governments. This paper articulates these indigenous principles and practices and contrasts them with those found in the scholarly literature on irrigation in Rajasthan which follows modern engineering concerns. Our analysis indicates a different set of questions to guide future research on surface impoundments and groundwater management. Furthermore, this study has broader implications for an understanding of the human-shaped hydrology of northwestern India, where the earlier system has been overlaid, but not fully displaced by subsequent irrigation projects. Indeed, indigenous practices involving groundwater recharge and

retrieval may have continued to flourish and expand, achieving a new order of hydrologic and adaptive complexity, through the local initiative of the peasantry to adapt to the unintended spillage, soakage, and siltage from the grand system of dams and perennial canals constructed by the state.

14846. **Rushton, K.R. 1994.** Assessing aquifer exploitation using observation boreholes. *Journal of the Institution of Water and Environmental Management*, 8(2):156-164.

*Aquifers / Groundwater extraction / Recharge / Pumping / Water table / India*

(Location: HQ Call No: P 3546 Record No: H 14784)

14847. **Sattar, M.A.; Haq, K.A. 1994.** Hydrogeological potentiality of intensive farmer-managed tubewell irrigation systems in Bangladesh: A case study. In *Abhayaratna, M.D.C.; Vermillion, D.; Johnson, S.; Perry, C. (Eds.), Farmer management of groundwater irrigation in Asia: Selected papers from a South Asian Regional Workshop on Groundwater Farmer-Managed Irrigation Systems and Sustainable Groundwater Management*, held in Dhaka, Bangladesh from 18 to 21 May 1992. Colombo, Sri Lanka: IIMI. pp.15-28.

*Farmer managed irrigation systems / Tube well irrigation / Groundwater irrigation / Aquifers / Case studies / Bangladesh*

(Location: HQ Call No: IIMI 631.7.6.3 G570 ABH Record No: H 15149)

14848. **Shankar, K. 1981.** Working of tube-wells in Phulpur Block. Preliminary Project Report, no.3, G.B. Pant Social Science Institute, Allahabad, 1981. 56p.

*Tube well irrigation / Water distribution / Pumping / India / Uttar Pradesh / Allahabad*

(Location: HQ Call No: P 3273 Record No: H 13756)

14849. **Slavich, P.G. 1992.** Irrigation using groundwater for watertable control: A model of water and salt balance limitations. *Australian Journal of Agricultural Research*, 43(1):225-239.

*Groundwater / Water table / Recharge / Water reuse / Soil salinity / Leaching / Infiltration / Water quality / Australia*

(Location: HQ Call No: P 3623 Record No: H 11783)

14850. **Smedema, B.; Zimmer, D. 1994.** Le drainage vertical et son utilisation associée à l'irrigation. [Vertical drainage and conjunctive use] *Grid*, 5:7-8.

*Drainage / Conjunctive use / Groundwater / Pakistan / Morocco / Indus River*

(Location: HQ Call No: P 3613 Record No: H 15364)

14851. **Smedema, B.; Zimmer, D. 1994.** Vertical drainage and conjunctive use. *Grid*, 5:7-8.

*Drainage / Conjunctive use / Groundwater / Pakistan / Morocco / Indus River*

(Location: HQ Call No: P 3572 Record No: H 15057)

14852. **Strosser, P.; Meinzen-Dick, R. 1994.** Ground water markets in Pakistan: An analysis of selected issues. In IIMI. Pakistan, Tenth progress report on managing irrigation systems to minimize waterlogging and salinity problems. Lahore, Pakistan: IIMI. pp.41.

*Groundwater / Tube wells / Water market / Pakistan*

(Location: HQ Call No: IIMI 631.7.5 G730 IIM Record No: H 14225)

14853. **Takeuchi, K. 1994.** The Asian network on water lifting devices for irrigation network activities in 1993-1995. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.253-256.

*Water lifting / Groundwater development / Irrigated farming / Networks / Asia*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14884)

14854. **Takeuchi, K.; Murty, V.V.N. 1994.** Overview of water lifting devices and groundwater management for irrigation in the Asia-Pacific region. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.13-26.

*Water lifting / Irrigation equipment / Groundwater irrigation / Groundwater management / Asia / Pacific Islands*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14859)

14855. **Thailand. Royal Irrigation Department; Howard Humphreys and Partners. 1984?** Sukhothai Groundwater Development Project: Background briefing. Project of the Royal Irrigation Department, Changwat Sukhothai, Thailand. 28p.

*Groundwater irrigation / Development projects / Aquifers / Irrigated farming / Sustainable agriculture / Technology transfer / Hydrology / Climate / Wells / Pumps / Water distribution / Monitoring / Agricultural extension / Thailand / Sukhothai Plain*

(Location: HQ Call No: P 3592 Record No: H 15185)

14856. **Todd, D.K. 1980.** Groundwater hydrology. New York, NY, USA: John Wiley & Sons. xiii, 535p.

*Groundwater management / Groundwater potential / Aquifers / Wells / Pollution / Water quality / Models / Remote sensing / Environmental effects / Salt water intrusion*

(Location: HQ Call No: 631.7.6.3 G000 TOD Record No: H 14077)

14857. **Underwood, M.R.; Peterson, F.L.; Voss, C.I. 1993.** Groundwater lens dynamics of atoll Islands. Water Resources Journal, 178:30-44.

*Groundwater / Hydrology / Models / Simulation*

(Location: HQ Call No: PER Record No: H 14042)

**Abstract:** A variable-density groundwater model is used to analyse the effects of various controls on the size of the freshwater lens, the structure of the transition zone, and the propagation of tidal fluctuations in a two-layer atoll island groundwater system. Modelling results indicate that mixing of fresh water and saltwater occurs primarily as a result of oscillating vertical flow due to tidal fluctuations and depends to a lesser extent on transverse dispersion along the dominantly horizontal recharge-discharge path of flow. The controls on the amount of mixing are: (a) the accumulated vertical distance, which increases with tidal range and is restricted by vertical permeabilities, and (b) vertical longitudinal dispersion. Comparison of cross-sectional simulations of atoll islands using non-tidal and tidal models shows that the non-tidal model must use artificially high values of transverse dispersivity to compensate for the lack of tidally driven, vertical mixing processes. Although the tidal model has high computational requirements, it can be used to calibrate vertical permeabilities and is best suited for problems dealing with groundwater resource evaluations, hydrologic events, and hydrologic processes. The limitations of the non-tidal model are that it cannot be used for calibration of vertical permeabilities and will not realistically simulate those cases in which transition zones are thick or recharge low.

14858. **Vadhanaphong, B. 1994.** Operation and maintenance of lift irrigation systems in Thailand. In FAO, Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.229-230.

*Water lifting / Irrigation operation / Maintenance / Thailand*

(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14879)

14859. **Vedula, S.; Sridharan, K. 1987.** Water logging and drainage problem and solutions: A case study of Narmadasagar and Omkareshwar reservoirs. Proceedings of the Northern Regional Seminar on Water Resources Development, Environmental Issues and Solutions, WAPCOS, Bhopal, India, 24-25 September 1987. pp.II-117-II-126.

*Waterlogging / Drainage / Reservoirs / Groundwater / Models / Case studies / India*  
(Location: HQ Call No: P 3529 Record No: H 14754)

14860. **Verdhen, T.P.A.; Sinha, R.S.; Verma, A.K. 1994.** Experience of community-managed tubewells in the command of a surface irrigation project. In Abhayaratna, M.D.C.; Vermillion, D.; Johnson, S.; Perry, C. (Eds.), *Farmer management of groundwater irrigation in Asia: Selected papers from a South Asian Regional Workshop on Groundwater Farmer-Managed Irrigation Systems and Sustainable Groundwater Management*, held in Dhaka, Bangladesh from 18 to 21 May 1992. Colombo, Sri Lanka: IIMI. pp.127-138.

*Tube well irrigation / Groundwater irrigation / Surface irrigation / Irrigation programs / Farmers' associations / Communal irrigation systems / Farmer managed irrigation systems / India*  
(Location: HQ Call No: IIMI 631.7.6.3 G570 ABH Record No: H 15151)

14861. **Vincent, L. 1994.** Parameters of doubt: Prospects for groundwater assessment to help farmers in hard rock areas of South India. In Abhayaratna, M.D.C.; Vermillion, D.; Johnson, S.; Perry, C. (Eds.), *Farmer management of groundwater irrigation in Asia: Selected papers from a South Asian Regional Workshop on Groundwater Farmer-Managed Irrigation Systems and Sustainable Groundwater Management*, held in Dhaka, Bangladesh from 18 to 21 May 1992. Colombo, Sri Lanka: IIMI. pp.47-53.

*Groundwater irrigation / Data collection / Farmer managed irrigation systems / Farmer participation / India*  
(Location: HQ Call No: IIMI 631.7.6.3 G570 ABH Record No: H 15150)

14862. **Wangchuk, K. 1994.** Management of groundwater resources. In FAO, *Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation*, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.112-113.

*Groundwater development / Bhutan*  
(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14866)

14863. **Wijesinghe, M.W.P. 1994.** Water lifting devices and management of groundwater resources for irrigation in Sri Lanka. In FAO, *Water lifting devices and groundwater management for irrigation: Report of the Expert Consultation of The Asian Network on Water Lifting Devices for Irrigation*, Bangkok, Thailand, 27 September - 1 October 1993. Bangkok, Thailand: FAO. pp.223-228.

*Water lifting / Groundwater management / Pumps / Groundwater irrigation / Wind power / Sri Lanka*  
(Location: HQ Call No: 631.7.6.3 G750 FAO Record No: H 14878)

14864. **Xue, S.; Ding, Y.; Cao, B.; Zhang, Z. 1991.** Effects of groundwater regulation and control in cropped area. In ICID, *The Special Technical Session Proceedings*, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.62-76.

*Groundwater management / Crop yield / China*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14729)

14865. **Zakara, Z.; Karbo, A.; Aranyossy, J.F. 1993.** Application des isotopes de l'environnement a l'etude des aquiferes des Korama, sud de Zinder (Niger) Bulletin de Liaison du Comité Interfricain d'Etudes Hydrauliques, No.94:49-58.

*Aquifers / Groundwater / Niger / Zinder*  
(Location: HQ Call No: P 3294 Record No: H 13897)

**Abstract:** A first environmental isotope study has been carried out on the "Korama" aquifers located in the south of the city of Zinder (Niger). Preliminary interpretation confirms that most of the aquifers are presently recharged by direct infiltration of rain water. Structural fractures seem to play an important role in the water circulation allowing vertical drainage of oldest water coming from deeper aquifers and facilitating the recharge by surface water in the phreatic zone. There does not appear any difference between the so-called "superficial Korama" and the "deep Korama" aquifers on the basis of the isotopic composition.

14866. **Zielinski, J. 1994.** Groundwater bioremediation. *World Water and Environmental Engineering*, June:14.

*Groundwater / Water quality / Pollution control / Environmental degradation*  
(Location: HQ Call No: PER Record No: H 15110)

## Rehabilitation

14867. **Aggarwal, J.R. 1992.** Modernization of tank irrigation in Tamil Nadu Closure Mission, October - December 1992. European Economic Community (Project no. NA/83-18, India) 28p.

*Tank irrigation / Modernization / India / Tamil Nadu*  
(Location: ICID Record No: 26155)

14868. **Brooks, R.H.; Metawie, A.F.; Abu-Zeid, M. 1992.** A concept for modernizing irrigation systems for sustainability. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management*, Leuven, Belgium, 14-17 September 1992. Vol. 1. Leuven, Belgium: Center for Irrigation Engineering. pp.73-80.

*Irrigated farming / Sustainable agriculture / Irrigation systems / Modernization / Rehabilitation / Egypt*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14337)

**Abstract:** The concept of modernization of irrigation systems is distinguished from the concept of rehabilitation by the International Congress on Irrigation and Drainage (ICID). In dealing with the subject of modernization as opposed to rehabilitation, one is faced with the question of what does modernization mean in terms of specific changes? During the past 10 years, five international conferences have convened to discuss modernization and rehabilitation of irrigation systems. Almost without exception authors and discussers have only dealt with rehabilitation. On-farm water management in many developing countries has been described as a "no man's land" producing uncertainty as how to proceed with modernization. This has resulted in rehabilitation of systems rather than modernization. The authors contend, however, that modernization should occur using a rational process with an end result that is appropriate for its users and the system. The process should deal with not only the requirements affecting modernization internal to the area, but also, the external requirements and the associated feedback mechanisms for achieving the objectives of the modernized area and the enhancement of its performance. A concept was suggested for modernizing Egypt's irrigation system and more particularly its irrigation-farming system. A process was developed by an interdisciplinary team of engineers and scientists for modernizing the farming system. The task was largely a learning experience during development and testing of the process. This process involves: (1) Problem identification, (2) Search for solutions, (3) Test solutions and (4) Dissemination of proven solutions. This process is discussed as it is applied to a farming system in the Lower Delta of Egypt. Although the process is simple and it can generally be handled by local consultants, it nonetheless, represents a quantitative way to proceed with modernization. As a result of this process, Egypt has adopted a National Irrigation Improvement Program to modernize their irrigation system.

14869. **Burton, M.; Ward, R. 1993.** Institutionalising training: A case study from Indonesia. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-F, Question 45, R30-R49: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.645-663.

*Irrigation programs / Training courses / Training and development / Case studies / Indonesia / Java*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15658)

14870. **Hoogendam, P. 1993.** Why Peruvian farmers re-designed a rehabilitation design. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.209-222.

*Farmer participation / Irrigation design / Rehabilitation / Peru*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15078)

14871. **IIMI. IRMU. 1994.** Monitoring farmers' involvement in rehabilitation: The case of five irrigation schemes under the National Irrigation Rehabilitation Project. IIMI. IRMU, Final draft report, Phase I of a study aimed at monitoring and evaluating farmer participation in NIRP rehabilitation. vii, 17p. + annexes.

*Rapid rural appraisal / Farmer participation / Farmers' associations / Rehabilitation / Construction / Irrigation programs / Monitoring / Case studies / Sri Lanka / Kurunegala / Wennoru Wewa / Kandy / Gampolawela Raja Ela / Udugoda Bandara Ela / Kobeigane Maha Wewa / Udawela Maha Ela*  
(Location: HQ Call No: IIMI 631.7.7 G744 IIM Record No: H 15360)

14872. **Jurriens, M.; Pinkers, M.J.H.P. 1993.** Maintenance of irrigation and drainage systems. In Jurriens, M.; Jain, K.P. (Eds.), Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands. New Delhi, India: ILRI/WALMI. pp.5-16.

*Maintenance / Irrigation systems / Drainage / Cost benefit analysis / Financing / India / Netherlands*  
(Location: HQ Call No: 631.7.1 G635 JUR Record No: H 15131)

14873. **Kamolratana, C.; Watanakarn, C. 1993.** Modernization of irrigation systems in Thailand. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.777-788.

*Irrigation systems / Modernization / Maintenance / Irrigation canals / Control methods / Thailand*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15244)

14874. **Karunakaran, K. 1994.** Tank rehabilitation in Tamil Nadu: A study of participatory management in irrigation. A thesis submitted to the Faculty of Engineering, in partial fulfillment of the requirements for the award of

the degree of Doctor of Philosophy in Civil Engineering, Anna University, Madras, India. xvii, 244p.

*Rehabilitation / Modernization / Tank irrigation / Participatory management / Farmer participation / Irrigation management / Water users' associations / Villages / Social aspects / Agriculture / Research / India / Tamil Nadu*  
(Location: HQ Call No: D 631.7.7 G656 KAR  
Record No: H 13882)

14875. **Pundarikanthan, N.V.; Narayanan, M.; Kalapiran, S.N. 1994.** Tank rehabilitation in Tamil Nadu: A case study on farmers' participation. In Sivamohan, M.V.K.; Scott, C.A. (Eds.), India: Irrigation management partnerships. Hyderabad, India: Booklinks Corporation. pp.309-331.

*Tank irrigation / Rehabilitation / Modernization / Farmer participation / Water users' associations / Water distribution / Case studies / India / Tamil Nadu*  
(Location: HQ Call No: 631.7.8 G635 SIV  
Record No: H 15000)

14876. **Siefers, H.J. 1993.** Canal maintenance in the Netherlands. In Jurriens, M.; Jain, K.P. (Eds.), Maintenance of irrigation and drainage systems Practices and experiences in India and the Netherlands. New Delhi, India: ILRI/WALMI. pp.21-33.

*Irrigation canals / Maintenance / Policy / Institutions / Costs / Legislation / Netherlands*  
(Location: HQ Call No: 631.7.1 G635 JUR  
Record No: H 15132)

14877. **Thailand. Ministry of Agriculture and Cooperatives. 1986.** Agricultural diversification and peoples' irrigation systems development: Maps and drawings. Draft final report prepared by TEAM Consulting Engineers Co. v.p.

*Crops / Diversification / Irrigation systems / Maps / River basins / Dams / Reservoirs / Canal construction / Weirs / Rehabilitation / Modernization / Thailand*  
(Location: HQ Call No: 631.7.7 G750 THA  
Record No: H 13790)

14878. **Vacca, G.; Porcheron, R. 1993.** Du "Canal du Verdon" au "Canal de Provence" Illustration d'une recherche de cohérence globale. [From the "Canal du Verdon" to the "Canal de Provence": Illustration of a search for overall consistence] ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-F, Question 45, R30-R49: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.599-615.

*Irrigation canals / Networks / Design / Irrigation management / Maintenance / Modernization / Rehabilitation / France*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15656)

14879. **Vecco, G. 1994.** Srey Ampil Irrigation Scheme rehabilitation experience Kingdom of Cambodia. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.263-266.

*Irrigation programs / Rehabilitation / Farmer participation / Financing / Cambodia*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15573)

14880. **Weerawardena, I.K. 1994.** Strategies for the development of farmer participation in the National Irrigation Rehabilitation Project. Paper presented at the Workshop on Farmer Participation in Planning, Design and Rehabilitation of NIRP Schemes: Current Status and Needed Improvements, Department of Irrigation, Colombo, Sri Lanka, 14 October 1994. 17p.

*Farmer participation / Irrigation management / Rehabilitation / Farmers' associations / Participatory management / Sri Lanka*  
(Location: HQ Call No: P 3625 Record No: H 11857)

14881. **Wolf, J.; Haack, B. 1994.** Rehabilitation assessment of the Helmand-Arghandab Valley Irrigation Scheme in Afghanistan. Water International, 19(3):121-128.

*Irrigation programs / Communal irrigation systems / Rehabilitation / GIS / Satellite surveys / Agricultural production / Afghanistan*  
(Location: HQ Call No: PER Record No: H 15495)

**Abstract:** The Helmand-Arghandab Valley irrigation system in southern Afghanistan is one of the country's most important capital resources. Prior to the civil and military conflict that has engulfed Afghanistan for more than 15 years, agricultural lands irrigated by the system produced a large proportion of the country's food grains and cotton. This study successfully employed Landsat satellite imagery, Geographic Information Systems, Global Positioning Systems, and field surveys to assess changes that have occurred in this system since 1973 as a consequence of the war. This information is a critical step in irrigation rehabilitation for restoration of Afghanistan's agricultural productivity.

### Policy and planning

14882. **199?** Irrigacao: Os pequenos projectos tem mais probabilidades de sucesso. [Irrigation: Small projects are most likely to succeed] Ago e desenvolvimento, 10(January-March):13-16.

*Project appraisal / Mozambique*  
(Location: ODI Call No: ODI Journals Record No: L 942329)



14883. **1994.** Future trends of Southeast Asian irrigated agriculture: A regional synthesis. IIMI Review, 8(1):33-34.

*Irrigated farming / Water resource management / Private sector / Public sector / Development policy / Indonesia / Malaysia / Philippines / Thailand*  
(Location: HQ Call No: PER Record No: H 15306)

14884. **1994.** Highlights of project audits. ADB Review, July-August:17-20.

*Development projects / Development policy / Development aid / Performance evaluation / Rural development / Irrigation programs / Indonesia / Malaysia / Nepal / Papua New Guinea / Philippines*  
(Location: HQ Call No: P 3589 Record No: H 15181)

14885. **1994.** Irrigation management - From bureaucracy to people. Economic Review, 20(6):3.

*Irrigation management / Farmer participation / Bureaucracy / Sri Lanka*  
(Location: HQ Call No: P 3608 Record No: H 15295)

14886. **1994.** Irrigation water management requires advanced decision-support tools. SCAN, 5:22-26.

*Irrigation management / Water management / Decision support tools / Performance*  
(Location: HQ Call No: P 3644 Record No: H 15535)

14887. **1989.** Operation procedures. v.p.

*Irrigation operation / Irrigation practices / Irrigation requirements / Water management / Water distribution / Measurement / Irrigation canals / Water users' associations / Indonesia / Sumatra / Java / Jatiluhur / Yogyakarta / Lampung*  
(Location: HQ Call No: P 3566 Record No: H 15036)

14888. **1994.** Report of the Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994: Report summary, conclusions and recommendations. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.1-11.

*Irrigation management / Water management / Networks*  
(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15197)

14889. Service management - A neglected essential in irrigation. Germany Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH. v.p.

*Irrigation management*  
(Location: ICID Record No: 26040)

14890. **Abdullah, K. 1994.** Malaysia. In Heim, F.; Abernethy, C.L. (Eds.), Irrigated agriculture in Southeast Asia beyond 2000: Proceedings of a Workshop held at Langkawi, Malaysia, 5 to 9 October 1992. Colombo, Sri Lanka: IIMI; DSE. pp.19-28.

*Irrigated farming / Agricultural policy / Irrigation management / Water management / Malaysia*  
(Location: HQ Call No: IIMI 631.7.8 G800 HEI Record No: H 15264)

14891. **Abernethy, C. 1993.** Guidelines on capacity-building and training, in relation to irrigation and drainage. Note prepared to provide a framework for discussions by the team on capacity-building and training, established under the Committee on Research and Future Developments of the ICID, at The Hague, 1 September 1993. 6p.

*Training / Human resource development / Irrigation management / Drainage / Water resource management*  
(Location: HQ Call No: IIMI 631.7.8 G000 ABE Record No: H 11784)

14892. **Abernethy, C.L. 1994.** Rapport de mission au Niger. [Report on a visit to Niger 12-25 June 1994] Progress report on PMI-Niger Collaborative Project. 40p. + annexes.

*Irrigation programs / Irrigation systems / Rice / Crop-based irrigation / Irrigation management / Economic aspects / Water costs / Niger*  
(Location: HQ Call No: IIMI 631.7.8 G212 ABE Record No: H 15165)

14893. **Abernethy, C.L. 1994.** DSE/IIMI program of dialogue and training for management of irrigation, 1990-94. IIMI Review, 8(1):28-30.

*Irrigation management / Training / Agricultural production / Indonesia / Malaysia / Philippines / Thailand*  
(Location: HQ Call No: PER Record No: H 15304)

14894. **Abernethy, C.L. 1994.** Report on a visit to Niger, 1-25 June 1994. Progress report on PMI-Niger Collaborative Project. 36p. + annexes.

*Irrigation programs / Irrigation systems / Rice / Crop-based irrigation / Irrigation management / Economic aspects / Water costs / Niger*  
(Location: HQ Call No: IIMI 631.7.8 G212 ABE Record No: H 15164)

14895. **Aeuckens, V.; Halse, R.W. 1993.** Managing the shift to sustainable irrigation: A case study in an area of the Murray-Darling Basin of Australia. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.305-314.

*Irrigation management / Sustainability / River basin development / Case studies / Rehabilitation / Policy / Australia*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15627)

14896. **Ahmad, S. 1994.** Irrigation and water management in the Indus Basin of Pakistan: A country report. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.190-211.

*Irrigation management / Water management / Land classification / River basin development / Salinity / Water table / Rain / Performance evaluation / Technology transfer / Non-governmental organizations / Rural development / Pakistan / Indus River*

(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15213)

14897. **Ahmed, A.A.; Ahmed, S.E. 1993.** Irrigation and drainage systems management in the Sudan. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.871-884.

*Irrigation management / Irrigation canals / Drainage / Design / Aquatic weeds / Sedimentation / Water control / Irrigation programs / Irrigation operation / Maintenance / Sudan*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15252)

14898. **Ali, I.A. 1993.** Irrigation performance at the major and minor canal levels in the Rahad Agricultural Project, Sudan. Unpublished project report presented to the Faculty of the Graduate School of Cornell University in partial fulfillment of the requirements for the Degree of Master of Professional Studies (Agriculture) x, 104p.

*Irrigation canals / Water management / Irrigation management / Irrigation scheduling / Water measurement / Water balance / Performance evaluation / Water use efficiency / Water distribution / Sudan*

(Location: HQ Call No: D 631.7.8 G146 ALI Record No: H 14982)

14899. **Altinbilek, H.D. 1992.** Irrigation development planning for the South Eastern Anatolia. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.1.

Leuven, Belgium: Center for Irrigation Engineering. pp.53-62.

*Irrigation programs / Irrigation management / Project planning / Turkey / Anatolia*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14335)

**Abstract:** The Southeastern Anatolia Project is a large-scale, and multi sectoral regional development project of Turkey. It is a combination of 13 projects primarily for irrigation and hydropower generation. It is planned that at full development over 1.6 million hectares of land will be irrigated and about 26x10<sup>9</sup> Kwh of hydroelectric energy will be generated annually. The total planned irrigation area corresponds to 19% of the total economically irrigable area of Turkey. Southeastern Anatolia Project has the top priority among national projects of Turkey. In this paper, the irrigation planning for Southeastern Anatolia are presented. Availability of water, physical structures, development scenarios, objectives and strategies, present and prospective problems associated are examined.

14900. **Ankum, P. 1992.** Desired behavior of irrigation systems. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 1. Leuven, Belgium: Center for Irrigation Engineering. pp.245-254.

*Irrigation management / Irrigation scheduling / Water allocation / Water delivery / Water demand / Flow control / Policy*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14353)

**Abstract:** In literature, different classifications on irrigation main system management are used at present. It is concluded that these classifications are not logic in their concepts, and that they depend heavily on concepts as developed at farm level. A new classification is proposed here, based on the water allocation at the "tertiary offtake." A distinction is made between (i) the parameters related to the decision-making on the water allocation (on-demand, semi-demand, arranged), and (ii) the parameters related to the method of water allocation (fixed, intermittent, varied discharge). The term "on-demand" is used when water is immediately available at the wish of the user. The term "semi-demand" is used when this water is only available after some time, e.g. because of the time-lag in the (upstream) control system. The term "arranged" refers to a water delivery that is not based on water requests of the users, but on pre-set arrangements. The above

parameters can be translated into a water management plan (no management, central management, self management), and ultimately into the required hardware of the flow control system and its operation rules.

14901. **Anver, R.K. 1991.** Operation of irrigation system. In ICID, The Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.14-38.

*Irrigation operation / Irrigation systems / Drainage / Irrigation scheduling / Sprinkler irrigation / Drip irrigation / Automation / Pakistan / Indus River*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14727)

14902. **Ariyabandu, R.D.S. 1994.** Participatory management policy under major irrigation. *Economic Review*, 20(6):18-19.

*Irrigation management / Participatory management / Policy / Farmer participation / Water management / Sri Lanka*

(Location: HQ Call No: P 3608 Record No: H 15300)

14903. **Ba Chinh, N. 1994.** Water development and management for sustainable agriculture in Vietnam. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.253-263.

*Sustainable agriculture / Water resources development / Water management / Irrigation management / Drainage / Constraints / Agricultural production / Organizational design / Water policy / Water rates / Vietnam*

(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15218)

14904. **Baba, K.M. 1994.** Irrigation development strategies in Sub-Saharan Africa: A comparative study of traditional and modern irrigation systems in Bauchi State of Nigeria. *Agriculture, Ecosystems and Environment*, 45:47-58.

*Irrigation management / Strategy planning / Small scale systems / Pumps / Agricultural production / Crop yield / Vegetables / Costs / Nigeria/ Africa South of Sahara / Bauchi*

(Location: HQ Call No: P 3369 Record No: H 14185)

**Abstract:** The focus of irrigation development in most sub-Saharan African countries appears to be shifting towards small-scale irrigation based on motorised pumps. The success of this approach depends, however, on its widespread adoption by farmers who are accustomed to traditional small-scale irrigation systems based on shadoof, calabashes, buckets, etc. To get the farmers to

adopt the modern system, it must be proved to be superior to the traditional methods. This study was therefore aimed at comparing the potentials of the new system with the traditional one. To achieve this, data were collected from farmers producing vegetables (tomato, pepper, onion and eggplant) under shadoof and pump irrigation systems in Bauchi State in the 1987-1988, 1988-1989 and 1989-1990 dry seasons. Analysis of the data revealed that pump irrigation is superior to shadoof in terms of resource use, yield and profit.

14905. **Babura, A.R.A. 1994.** Wurno Irrigation Project of Sokoto: A case study of participatory Irrigation management. In Pradhan, P.; Abdulmumin, S. (Eds.), Participatory irrigation management in Nigeria: Proceedings of a National Seminar held at National Water Resources Institute, Kaduna, Nigeria, 9-10 November 1993. Kaduna, Nigeria: NWRI. pp.67-73.

*Participatory management / Irrigation management / Farmer participation / Water users' associations / Rehabilitation / Irrigation programs / Nigeria / Sokoto*

(Location: HQ Call No: IIMI 631.7.8 G214 PRA Record No: H 14959)

14906. **Bandaragoda, D.J. 1992.** Importance of irrigation policy analysis for sustainability. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.) Proceedings of the International Conference on Advances in Planning, Design and Management of Irrigation Systems as Related to Sustainable Land Use, Leuven, Belgium, 14-17 September 1992. Leuven, Belgium: Center for Irrigation Engineering. pp.81-92.

*Water management / Policy / Sustainability / Irrigated farming / Institution building / Pakistan*

(Location: HQ Call No: 631.7.1 G000 FEY. IIMI 631.7.8 G000 BAN Record No: H 3395)

14907. **Bandaragoda, D.J.; Saeed ur Rehman. 1994.** Institutional perspectives of land reclamation operations in Punjab: A case study of the Lower Chenab Canal (East) Circle Area. Colombo, Sri Lanka: IIMI. xv, 60p. (IIMI working paper - Pakistan; no.28)

*Land reclamation / Soil salinity / Irrigated sites / Irrigation canals / Irrigation water / Institutions / Legal aspects / Irrigation scheduling / Water availability / Irrigated farming / Case studies / Pakistan / Punjab*

(Location: HQ Call No: IIMI 631.7.8 G730 BAN Record No: H 14383)

**Abstract:** The Directorate of Land Reclamation (DLR), which was set up in 1945, is a special unit of Punjab's Irrigation and Power Department for undertaking research and field operations to combat the problem of salinity. Approaching the end of five decades of existence, the directorate is yet to demonstrate its effectiveness in its assigned task; its inability to fully cope with the conditions of a fast changing irrigation environment makes

this rather an illusive goal. In the selection of lands for reclamation, the Directorate is heavily dependent on the visual salinity survey (Thur Girdawari) carried out every year by the Irrigation Department's field staff. This visual survey appears to be a quick and cost-effective method of assessing surface salinity, but its exclusive use as the criterion for selection of affected land is a questionable approach. According to original departmental procedure, reclamation activities were confined to only two of the five classes of soil identified by the visual salinity survey, but the current practice of including all the types of salt-affected soils in reclamation operations has made the selection process more subjective. Surprisingly, the DLR is not using its existing laboratory facilities optimally to better identify the salt-affected lands. Soil testing in visually identified lands could also help define the reclamation operations more scientifically in addition to improving the selection methods being used. While formal procedure requires the Directorate to communicate to farmers the details of planned reclamation schemes, farmer awareness of the reclamation program seems to be poor and only a few farmers in the study area readily acknowledge agency assistance in obtaining relevant information. In practice, the proposals for reclamation schemes are often initiated by some influential farmers. It is a requirement that the amount of water made available for reclamation be over and above the design supply of a given distributary, and special reclamation outlets can be given from a distributary only on the basis that its tail will not suffer. However, the study shows no evidence to show that extra water was made available during the operation of reclamation outlets; further, tail-end shortages were observed in all the distributaries under the study. In a context where the tendency is to give scant consideration to irrigation rules and procedures, it is unlikely that the Directorate of Land Reclamation in its present form and status will succeed in implementing an extensive program of reclamation operations. For the Directorate to be effective in its legitimate functions and to make it an operationally viable and socially acceptable organizational unit, adequate policy and institutional support seem to be necessary.

14908. **Bandaragoda, D.J.; Skogerboe, G.V. 1994.** Research inputs for an action program on participatory irrigation management in Pakistan. Paper prepared for the Seminar on Participatory Irrigation Management, co-sponsored by the Ministry of Water and Power of the Islamic Republic of Pakistan and the Economic Development Institute of the World Bank, Islamabad, Pakistan, 2-6 October 1994. 42p.

*Participatory management / Irrigation management / Research / Policy / Social aspects / Irrigated farming / Groundwater / Tube wells / Water delivery / Equity / Pakistan / Philippines / Nigeria / Sri Lanka / Nepal / Indonesia / Colombia / India*

(Location: HQ Call No: IIMI 631.7.8 G730 BAN Record No: H 12813)

14909. **Banik, A. 1994.** Technical efficiency of irrigated farms in a village of Bangladesh. *Indian Journal of Agricultural Economics*, 49(1):70-78.

*Irrigation efficiency / Irrigated farming / Farm management / Performance evaluation / Villages / Bangladesh*

(Location: HQ Call No: P 3471 Record No: H 14609)

14910. **Barbagallo, S.; Mazzola, G.; Zimbone, S.M. 1993.** A survey of the operation of Sicilian irrigation systems. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.273-282.

*Irrigation systems / Irrigation management / Irrigation operation / Water demand / Irrigation efficiency / Water distribution / Performance / Farmers' associations / Sicily*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15625)

14911. **Bastiaansen, A.P.M.J. 1993.** Towards an improved approach to irrigation planning and design: The case of the South-West Kano Irrigation Scheme, Kenya. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.723-733.

*Irrigation design / Management planning / Irrigation programs / Water distribution / Farmers' attitudes / Farmer participation / Water users' associations / Case studies / Kenya / Kano*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15240)

14912. **Beaumont, P. 1994.** The myth of water wars and the future of irrigated agriculture in the Middle East. *Water Resources Development*, 10(1):9-22.

*Water resource management / Irrigated farming / Case studies / Water use / Water policy / Middle East / Israel / Kuwait / Egypt / Turkey / Iraq / Syria / Sudan / Euphrates River / Nile River*

(Location: HQ, ODI Call No: PER Record No: H 14102)

**Abstract:** Recent papers have claimed that in the Middle East the pressure on available water resources might result in hostilities between certain

- states. This paper argues that such wars are unlikely given that most water in the region is being used, mostly inefficiently, for irrigation purposes. It is claimed that the water problems of most countries could be solved by diverting a relatively small amount of water from irrigation to higher value urban/industrial uses. Food production would suffer somewhat but the richer countries could make good these losses by purchases on the world market. Inevitably, irrigated agriculture in the Middle East must contract as growing populations demand more water for their needs.
14913. **Berger, T.R. 1994.** The independent review of the Sardar Sarovar projects 1991-1992. *Water Resources Development*, 10(1):55-66.  
*Dams / Environmental effects / Irrigation effects / Project appraisal / India / Sardar Sarovar Project*  
(Location: ODI Call No: ODI Journals Record No: L 941151)
14914. **Biswas, M.R. 1993.** Unrealized potentials for improving the performance of Bangladesh irrigation systems. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.131-144.  
*Performance evaluation / Irrigation requirements / Water requirements / Crop production / Irrigation systems / Rice / Bangladesh*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15072)
14915. **Bos, M.G. 1992.** Irrigation system monitoring and project evaluation. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), *Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.441-451.*  
*Irrigation systems / Performance evaluation / Irrigation efficiency / Performance indexes / Monitoring / Computer techniques / Irrigation water / Water supply / Water distribution / Thailand / Sri Lanka*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14425)
14916. **Braun, A. 1994.** The megaproject of Mesopotamia. *Ceres*, 26(2):25-30.  
*River basin development / Dams / Irrigation programs / Turkey*  
(Location: HQ Call No: P 3505 Record No: H 14659)
14917. **Brewer, J.D. 1994.** The participatory irrigation system management policy in Sri Lanka. *Economic Review*, 20(6):4-6, 8-9.  
*Irrigation management / Participatory management / Farmer participation / Policy / Sri Lanka*  
(Location: HQ Call No: P 3608 Record No: H 15296)
14918. **Brewer, J.D. 1994.** What is "participatory irrigation system management"? *Economic Review*, 20(6):7.  
*Irrigation management / Participatory management / Farmer participation / Sri Lanka*  
(Location: HQ Call No: P 3608 Record No: H 15297)
14919. **Brito, R.A.L. 1994.** Holistic approach to irrigation management in developing countries. *Journal of Irrigation and Drainage Engineering*, 120(5):994-1004.  
*Irrigation management / Developing countries / Performance evaluation / Monitoring / Latin America / Africa*  
(Location: HQ Call No: PER Record No: H 15381)
14920. **Brown, E.P.; Nooter, R. 1992.** Successful small-scale irrigation in the Sahel. Washington, DC, USA: World Bank. xii, 65p. (World Bank technical paper no.171)  
*Small scale systems / Irrigation programs / Project appraisal / Project design / Farmer participation / Farmers' attitudes / Water users' associations / Decision making / Economic aspects / Credit / Public sector / Case studies / Development aid / Development banks / Sahel / Africa / Burkina Faso / Cameroon / Chad / Mali / Mauritania / Niger / Nigeria / Senegal*  
(Location: HQ Call No: 631.7.8 G152 BRO Record No: H 14649)
14921. **Bruns, B. 1993.** Promoting participation in irrigation: Reflections on experience in South Asia. *World Development*, 21(11):1837-1849.  
*Irrigation programs / Irrigation management / Development projects / Farmer participation / Thailand / Indonesia / Philippines*  
(Location: HQODI Call No: P 3263 Record No: H 13741)  
**Abstract:** This paper examines efforts to institutionalize greater participation in irrigation development in Thailand, Indonesia and the Philippines. Agencies have successfully fielded facilitators to promote increased participation. Farmers' ideas have helped to improve the siting of structures and canals. Participation has been limited by the lack of appropriate designs, the difficulty of incorporating cost-sharing requirements into ongoing projects and by policies which give farmers incentives to neglect maintenance. Further progress requires going

beyond reforming centralized technical agencies to develop approaches which enable greater local self-reliance in financing and management of irrigation.

14922. **Bryant, M.J.; Pigram, J.J. 1993.** Options for future irrigation infrastructure and water supply in the Murrumbidgee Irrigation Area, Australia. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.245-255.

*Irrigation operation / Infrastructure / Water supply / Rehabilitation / Modernization / Costs / Australia*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15623)

14923. **Burton, M.A. 1994.** The irrigation management game: A role playing exercise for training in irrigation management. Irrigation and Drainage Systems, 7(4):305-318.

*Irrigation management / Management training*  
(Location: HQ Call No: PER Record No: H 15507)

14924. **Carruthers, I. 1993.** Irrigation challenges of the 1990's. Hommes Teres et Eaux, 23(90):5-10.

*Irrigation management / Agricultural policy / Strategic management / Morocco*  
(Location: HQ Call No: P 3580 Record No: H 15172)

14925. **Carruthers, I. 1992.** Irrigation project management. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.2. Leuven, Belgium: Center for Irrigation Engineering. pp.709-716.

*Irrigation management / Irrigation programs / Agriculture / Farmers*  
(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14451)

14926. **Charoy, J. 1990.** L'hydraulique au service des aménagements hydroagricoles. In Agronomie et Ressources Naturelles en Régions Tropicales, Montpellier, France, 12-15 September 1989: Proceedings. Montpellier, France: IRAT/CIRAD. pp.385-397.

*Hydrology / Small scale systems / Irrigation / Agroclimatology / Africa*  
(Location: HQ Call No: P 3433 Record No: H 14560)

14927. **Chaudhary, T.N. 1994.** Status of irrigation and irrigated agriculture in India. Paper presented at the Seminar

on Agricultural Water Management Technology, organized by Asia Productivity Organization, Sri Lanka, 12-16 July 1994. 26p.

*Irrigation programs / Water resources development / Water management / Performance evaluation / Crop production / Farmer participation / India*  
(Location: HQ Call No: P 3537 Record No: H 14775)

14928. **Constable, D.; Rao, P.S.; Franca, Z.P. 1993.** Instructional materials used during the Workshops on Irrigation Management: Delivery of TNA Results, Strategic Planning and Human Resources Development, Wad Medani, 25-30 September 1993. Vol. II. Collaborative Institutional Development Program of the Ministry of Irrigation (MOI), Sudan and IIMI, Sri Lanka. ii, 168p.

*Irrigation management / Training / Human resource development / Teaching materials / Strategy planning*  
(Location: HQ Call No: IIMI 631.7.8 G000 CON Record No: H 13688)

14929. **Craig, K.R.; Silva, J.P.; Dimmitt, A.K. 1993.** Irrigation in competition for water in Alberta, Canada and Southern California, USA. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-G, Special session - Irrigation and drainage in competition for water. New Delhi, India: ICID. pp.145-162.

*Water requirements / Water conservation / Water allocation / Water management / Canal linings / USA / Canada / Alberta / California*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15727)

14930. **Dan Bithu, B. 1993.** Irrigation and drainage in Western Thar Desert (India) In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, R1-R35: Planning and design of irrigation and drainage systems. pp.43-49.

*Sprinkler irrigation / Arid zones / Soil moisture / Water harvesting / Irrigated farming / Irrigation practices / Cost benefit analysis / India / Thar Desert / Rajasthan*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15064)

14931. **Dedrick, A.R.; Clyma, W.; Tenney, O.L.; Clemmens, A.J.; Gibson, R.D.; Levine, D.B.; Replogle, J.A.; Rish, S.A.; Ware, R.E.; Wilson, P.N. 1993.** A demonstration irrigation management improvement program. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Insti-

tutional and financial interrelationships. New Delhi, India: ICID. pp.95-104.

*Irrigation management / Irrigation programs / Irrigated farming / Performance / USA / Arizona*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15613)

14932. **Deveze, J.C. 1993.** Large irrigation projects facing a difficult transition in Africa and Madagascar. [De grandes aménagements hydr-agricoles confrontés à une transition difficile en Afrique et au Madagascar] ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-E, Question 45, R1-R29: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.121-132.

*Irrigation programs / Large-scale systems / Irrigation management / Financing / Africa / Madagascar*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15615)

14933. **Dhawan, B.D. 1993.** Indian water resource development for irrigation: Issues, critiques, reviews. New Delhi, India: Commonwealth Publishers. vii, 277p.

*Water resources development / Irrigation management / Dams / Groundwater / Irrigation canals / Shallow tube wells / Drought / Population / Small scale systems / Large-scale systems / Conjunctive use / Natural disasters / Flood control / Irrigated farming / Water use / Evaluation / Environmental degradation / India / Tehri Dam / Sardar Sarovar Project / Narmada Project / Punjab / Tamil Nadu*  
(Location: HQ Call No: 631.7.8 G635 DHA  
Record No: H 15129)

14934. **Dhawan, B.D. 1993.** Reassessment of irrigation potential. Economic and Political Weekly, October:2371-2372.

*Water potential / Performance evaluation / Irrigation efficiency / India / Gujarat*  
(Location: HQ Call No: P 3256 Record No: H 13734)

14935. **Dimick, F.E. 1991.** Conserving water through management changes on the Newlands Project. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.21-30.

*Water conservation / Irrigation management / Reservoirs / Water delivery / USA*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 14912)

14936. **Dingle, M.A.; Ramli, M. 1994.** Evaluation of the socio-economic performance of the Rahad Irrigated Scheme. Report, IIMI, Sudan Field Operations. 16p.

*Irrigation programs / Performance evaluation / Crop yield / Labor / Economic aspects / Sudan / Rahad Scheme*

(Location: HQ Call No: IIMI 631.7.8 G146 DIN  
Record No: H 14771)

14937. **Durga, K.C.; Pradhan, U. 1993.** Indigenous knowledge and organizational process: Experiences and lessons from local Nepali irrigation systems. In Tamang, D.; Gill, G.J.; Thapa, G.B. (Eds.), Indigenous management of natural resources in Nepal. Kathmandu, Nepal: HMG Ministry of Agriculture; Winrock International. pp.228-249.

*Irrigation management / Irrigation practices / Farmer managed irrigation systems / Water allocation / Conflict / Water distribution / Nepal / Palpa*  
(Location: HQ Call No: 333.7 G726 TAM Record  
No: H 14109)

14938. **Easter, K.W.; Hearne, R.R. 1993.** Decentralizing water resources management: Economic incentives, accountability and assurance. Washington, DC, USA: World Bank. Agricultural Policies Division, Agriculture and Natural Resources Department. 27p. (Policy research working paper 1219)

*Water resource management / Water policy / Economic aspects / Irrigation management / Water users' associations / Tube wells / Groundwater / Water supply / Irrigation efficiency / Developing countries*  
(Location: HQ, ODI Call No: P 3522 Record No: H 14722)

14939. **El-Beltagy, A.S. 1993.** Capacity building for agricultural water management in Egypt. In FAO, Integrated rural water management: Proceedings of the Technical Consultation on Integrated Rural Water Management, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.263-274.

*Water quality / Water resource management / Pollution / Agricultural production / Irrigation water / Human resource development / Egypt*  
(Location: HQ Call No: 333.91 G000 FAO  
Record No: H 14161)

14940. **Eriksen, J.; Poulin, R. 1993.** Contrasting approaches for water policy development in Tunisia and Sri Lanka: Lessons learned from USAID Mission experience. Virginia, VA, USA: ISPAN. vii, 62p.

*Water policy / Water users' associations / Irrigation management / Policy making / Tunisia / Sri Lanka*  
(Location: HQ Call No: 631.7.8 G240 ERI  
Record No: H 13711)

Note: An applied study prepared for the Asia and Near east Bureau of USAID by ISPAN.

14941. **Estrada, L.A.L. 1993.** Water management in irrigated agriculture in Mexico. In FAO, Integrated rural

water management: Proceedings of the Technical Consultation on Integrated Rural Water Management, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.275-282.

*Water management / Irrigation management / Modernization / Crop production / Mexico*  
(Location: HQ Call No: 333.91 G000 FAO  
Record No: H 14162)

14942. **FAO. 1993.** Water policies and agriculture. In USAID. Asia and Near East Bureau; ISPAN, Future directions for implementing water policy. A workshop held at the University of Maryland University College Conference Center, Maryland, USA, 28-29 April 1994, as an added document. (In FAO, The state of food and agriculture, Part III. Rome, Italy: FAO) pp.228-282.

*Water policy / Agricultural policy / Water use / Water resource management / Sustainability / Water availability / Water pollution / Economic aspects / Aquifers / Water market / Water allocation / Pollution control*  
(Location: HQ Call No: 631.7.8 G000 USA  
Record No: H 14488)

14943. **Fernando, N. 1992.** Monitoring irrigation water delivery performance: The concept of cumulative relative water supply (CRWS) In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.525-534.

*Relative water supply / Water delivery performance / Irrigation canals / Irrigation water / Irrigation management / Monitoring / Sri Lanka / Kirindi Oya*  
(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14433)

14944. **Feyen, J.; Deckers, J.; Vandenbroucke, D.; Dudal, R. 1992.** Sustainable irrigated farming through multidisciplinary land use planning. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.587-596.

*Irrigated farming / Land use / Soils / Sustainable agriculture / Hydrology / Climate / Rivers / Irrigation programs / Tanzania / Kirua Irrigation Project*  
(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14439)

14945. **França, Z.P. 1994.** Irrigation management training for institutional development: A case study from Malaysia. Colombo, Sri Lanka: IIMI. xxxii, 244p. (IIMI case study no.4)

*Irrigation management / Training / Strategy planning / Research / Human resources / Institution building / Malaysia*  
(Location: HQ Call No: IIMI 631.7.8 G714 FRA  
Record No: H 14942)

14946. **Franca, Z.P.; Rao, P.S. 1993.** Report of the Workshop on Irrigation Management: Delivery of TNA Results, Strategic Planning and Human Resource Development, Wad Medani, 25-30 September 1993. Vol.I. Collaborative Institutional Development Program of the Ministry of Irrigation, Sudan and IIMI, Sri Lanka. iv, 106p.

*Irrigation management / Training / Human resource development / Strategy planning*  
(Location: HQ Call No: IIMI 631.7.8 G000 FRA  
Record No: H 13687)

14947. **Franca, Z.P. 1991.** Summarized report on DSE/IIMI Workshop on New Trends and Policies in Irrigation Management, Colombo, Sri Lanka, 15-18 November 1990. 5p. + annexes.

*Irrigation management / Performance / Sustainability / Training / Development policy / South East Asia / Malaysia / Thailand / Indonesia / Sri Lanka*  
(Location: HQ Call No: IIMI 631.7.8 G000 FRA  
Record No: H 13751)

14948. **Frazão, F.F.; Pereira, L.S. 1993.** Application of indicators to compare the performance of irrigation systems. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.365-376.

*Irrigation programs / Performance evaluation / Performance indexes / Irrigation management / Water availability / Water management / Water distribution / Indicators / Portugal*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15089)

14949. **Gadelle, F. 1994.** IPTRID addresses irrigation development in West Africa. Grid, 5:11.

*Irrigation management / Food production / Agricultural development / West Africa*  
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14950. **Galvez, J.A. 1994.** Measures to improve the performance of irrigation systems in the Philippines. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irriga-



tion/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.212-217.

*Irrigation management / Performance evaluation / Irrigation systems / Irrigation programs / Development aid / Philippines*  
(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15214)

14951. **Gamaathige, A. 1994.** Progress of resource mobilization in sample distributary channel areas in two INMAS schemes. *Economic Review*, 20(6):15-17.

*Resource allocation / Irrigation programs / Maintenance / Privatization / Farmer participation / Farmers' associations / Financial planning / Development policy / Sri Lanka / Mee Oya / Rajanganaya / Abakola Wewa*  
(Location: HQ Call No: P 3608 Record No: H 15299)

14952. **Garces-Restrepo, C.; Vermillion, D.L. 1994.** La transferencia del manejo del riego en Colombia: Un experimento piloto y sus consecuencias. [Irrigation management transfer in Colombia: A pilot experiment and its consequences] In Vélez, E.P.; Garcia, A.E.; Panta, J.E.R.; Saenz, E.M.; Barrios, J.M.D. (Eds.) *Seminario Internacional sobre la Transferencia de los Sistemas de Riego*, Cd. Obregón, Sonora, México del 4 al 7 de Mayo de 1994: Memorias. Montecillo, México, Colegio de Postgraduados. pp.235-255.

*Irrigation management / Privatization / Farmer-agency interactions / Water users' associations / Policy / Farmers' attitudes / Colombia / Coello / Saldaña*  
(Location: HQ Call No: IIMI 631.7.8 G518 GAR Record No: H 14770)

14953. **Garces-Restrepo, C.; Vermillion, D.L. 1994.** Irrigation management transfer in Colombia: A pilot experiment and its consequences. Paper presented at the Regional Workshop on Transfer of Irrigation Systems, Ciudad Obregon, Mexico, 4-7 May 1994. 21p.

*Irrigation management / Privatization / Farmer-agency interactions / Water users' associations / Policy / Farmers' attitudes / Colombia / Coello / Saldaña*  
(Location: HQ Call No: IIMI 631.7.8 G518 GAR Record No: H 14769)

14954. **Gautam, U.; Gautam, K.M.; Pant, A.B. 1992.** Nepal: Institutional instruments for managing irrigation sector development program. Nepal. Department of Irrigation (DOI); Irrigation Sector Support Project. 170p. (Policy document NEP/89/006)

*Irrigation management / Policy / Irrigation programs / Nepal*  
(Location: ODI Call No: I 197. RRMG Record No: L I 197)

14955. **Gazmuri S.R. 1994.** Chilean water policy. Colombo, Sri Lanka: IIMI. v, 9p. (Short report series on locally managed irrigation no.3)

*Water policy / Water rights / Legislation / Water users' associations / Chile*  
(Location: HQ Call No: IIMI 631.7.8 G516 GAZ Record No: H 14113)

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*Management Information Systems / Monitoring / Irrigation management / Water use efficiency / Performance evaluation / Performance indexes / Farmer participation / Asia*  
(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15220)

14957. **Godaliyadda, G.G.A. 1994.** Improved irrigation/water management for sustainable agricultural development in Sri Lanka. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.218-226.

*Irrigation management / Water management / Sustainable agriculture / Agricultural development / Policy / Constraints / Training / Monitoring / Performance evaluation / Sri Lanka*  
(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15215)

14958. **Gold, R.L. 1991.** A national change in reclamation water resources planning. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. pp.1-10.

*Water resources development / History / USA*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14886)

14959. **Gong, X. 1994.** A better reform form of management system in irrigation districts: The system of contracted managerial responsibility. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.283-288.

*Irrigation management / Contracts / Irrigation canals / Economic aspects / China*  
(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15575)

14960. **Gosain, A.K. 1994.** Management information system for farmer-managed irrigation systems. In Lauraya, F.M.; Wijayarathna, C. M.; Vermillion, D. L. (Eds.), *Infor-*

mation support systems for farmer managed irrigation: Selected proceedings of the Asian Regional Workshop on the Inventory of Farmer Managed Irrigation Systems and Management Information Systems, Tagaytay City, Philippines, 13-15 October 1992. Colombo, Sri Lanka: IIMI. pp.25-34.

*Farmer managed irrigation systems / Management Information Systems / Irrigation management*  
(Location: HQ Call No: IIMI 631.7.3 G570 LAU  
Record No: H 14787)

14961. Goto, A.; Mizutani, M. 1994. Evaluation of irrigation performance in relation to environmental aspects. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.40-49.

*Performance evaluation / Environmental effects / Irrigation programs / Japan*  
(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15199)

14962. Gowing, J.; El-Awad, O. 1992. Farmer perspectives on irrigation performance: Evaluation of water supply utility. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.555-562.

*Irrigation systems / Performance evaluation / Water supply / Farmer participation / Farmers' attitudes / Sudan*  
(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14436)

14963. Greydanus, H.W. 1993. L'irrigation et le drainage en concurrence pour l'eau. [Irrigation and drainage in competition for water] In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-H: Session speciale. Rapport general(F). New Delhi, India: ICID. pp.207-225.

*Water management / Water use / Water demand / Irrigation operation / Case studies*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15739)

14964. Guskov, E. 1991. Irrigation management. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.112-118.

*Irrigation management / Water conservation / Surface irrigation / Irrigation systems / Water policy / Water use efficiency / Russian Federation*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 14920)

14965. Hamster, F.C.; Jurriens, M. 1993. Development of a canal maintenance policy. In Jurriens, M.; Jain, K.P. (Eds.), Maintenance of irrigation and drainage systems: Practices and experiences in India and the Netherlands. New Delhi, India: ILRI/WALMI. pp.85-93.

*Maintenance / Institutions / Organizations / Irrigation design / Irrigation equipment / Mechanical methods / Policy / Netherlands*  
(Location: HQ Call No: 631.7.1 G635 JUR  
Record No: H 15136)

14966. Heim, F. 1994. DSE-IIMI activities in irrigation management. IIMI Review, 8(1):30-32.

*Irrigation management / Research institutes / Training*  
(Location: HQ Call No: PER Record No: H 15305)

14967. Heim, F.; Abernethy, C.L. (Eds.) 1994. Irrigated agriculture in Southeast Asia beyond 2000: Proceedings of a Workshop held at Langkawi, Malaysia, 5 to 9 October 1992. Colombo, Sri Lanka IIMI; DSE. xi, 135p.

*Water management / Irrigated farming / Institution building / Technology / Training / Policy / Research / Education / Social aspects / Economic aspects / Sustainability / Priority setting / South East Asia / Indonesia / Malaysia / Philippines / Thailand*  
(Location: HQ Call No: IIMI 631.7.8 G800 HEI  
Record No: H 15262)

14968. Hengan, W.; Yonjiu, X. 1993. Discussion of allocation of incremental irrigation benefits. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-F, Question 45, R30-R49: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.631-644.

*Irrigation effects / Irrigated farming / Benefits / Irrigation programs / Agricultural production / Costs / Economic aspects / China / India*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15657)

14969. Huibers, F.P. 1992. Intermediate irrigation schemes in the Senegal River Valley. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.99-106.

*River basins / Agricultural production / Irrigated farming / Farmers' attitudes / Rice / Irrigation*

*programs / Economic analysis / Africa South of Sahara / Senegal*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14340)

**Abstract:** In the Senegal river valley, village irrigation schemes have spread rapidly since their inception. These farmer managed schemes are cheap in construction and operation and are far more productive than the "large", state managed schemes of the delta. In many of the village schemes exploitation costs are paid for by the income from migrant workers, while the produce, mostly rice, is consumed locally for its major part. In order to combine the organizational success of the village schemes and the commercial production of the delta schemes, planners invented the concept of an intermediate scheme. However, the assumptions that have led to this concept were not always right. Although such schemes provide the technical infrastructure that allows for intensive cultivation, not many farmers have time, credit facilities and incentives to make use of this. More importantly, the scheme management by farmer groups appears not transferable from the village schemes to intermediate schemes as the objectives of production in these two approaches are different.

14970. **Huppert, W.; Walker, H.H. 1989.** Management of irrigation systems: Guiding principles. Germany, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH. 114p. (Rural development series no.240)

*Irrigation systems / Irrigation management*

(Location: ICID Record No: 26039)

14971. **Huppert, W. 1993.** Service management in irrigation: A case of neglect. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-F, Question 45, R30-R49: Irrigation and drainage systems management - Institutional and financial interrelationships. New Delhi, India: ICID. pp.575-584.

*Irrigation management / Networks*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15654)

14972. **ICID. 1991.** Development of irrigation, drainage and flood control in India. New Delhi, India ICID. x, 65p.

*Irrigation management / Drainage / Flood control / Water management / Conjunctive use / Farmer participation / Training / Water policy / Water law / India*

(Location: HQ Call No: 631.7.8 G635 ICI Record No: H 14816)

14973. **IIMI. 1994.** Comparison of support services for farmer-managed irrigation systems in Sri Lanka and Nepal. Final report. Program on Farmer-Managed Irrigation Systems and Support Services. Phase II. Vol.2. xiii, 81p.

*Farmer managed irrigation systems / Policy / Non-governmental organizations / Rehabilitation / Farmers' associations / Organizations / Sri Lanka / Nepal*

(Location: HQ Call No: IIMI 631.7.8 G744 IIM Record No: H 15635)

14974. **IIMI; DSE. 1993.** DSE-IIMI Workshop and Consultancy mission on Diagnosing Training Needs and Designing Training and Teaching Programmes for Irrigation Management in Yogyakarta, Indonesia, 22 June - 9 July 1993. Workshop report connected with the joint programme on "Dialogue and Training in Irrigation Management", designed for the special conditions in the four ASEAN countries, Indonesia, Malaysia, Philippines and Thailand. 21p.

*Irrigation management / Training needs assessment / Training and development / Agriculture / Indonesia*

(Location: HQ Call No: IIMI 631.7.8 G000 IIM Record No: H 13892)

14975. **IIMI. 1994.** Farmer-managed irrigation systems in Chitral, Pakistan: Technology, management performance and needs for support. Final report on Program on Farmer-Managed Irrigation Systems and Support Services. Phase II. Vol.4. xv, 57p.

*Farmer managed irrigation systems / Case studies / Performance / Irrigation management / Water rights / Pakistan / Chitral*

(Location: HQ Call No: IIMI 631.7.8 G730 IIMI Record No: H 15542)

14976. **IIMI. 1994.** Gender issues and irrigation management: First annual progress report for 1993/1994. Colombo, Sri Lanka: IIMI. v.p.

*Gender relations / Irrigation management / Development projects / Irrigation programs / Participatory management / Farmers' associations / Households / Women in development / Case studies / Nepal / Niger / Sri Lanka / Burkina Faso*

(Location: HQ Call No: IIMI 631.7.8 G000 IIM Record No: H 14943)

14977. **IIMI; HR Wallingford. 1994.** Irrigation Management Improvement Project: Final report. Vol.1 Main report; Vol.2 - Annexes. Colombo, Sri Lanka: IIMI. 2 vols.; vii, 53p.; 336p.

*Irrigation management / Computer software / Databases / Decision making / Project management / Monitoring / Data collection / Irrigation canals / Irrigation scheduling / Crop-based irrigation / Performance evaluation / Sri Lanka / Ingimitiya*

(Location: HQ Call No: IIMI 631.7.8 G744 IIM Record No: H 13996)

14978. **IIMI. Burkina Faso. 1994.** Projet management de l'irrigation au Burkina Faso: Rapport d'activités année

3:1993/94. [Activity report, year 3:1993/94, IIMI, Ouagadougou, Burkina Faso, July 1994] 71p.

*Irrigation management / Research institutes / Burkina Faso*

(Location: HQ Call No: IIMI 631.7.8 G226 IIM Record No: H 15713)

14979. **IIMI. Philippines; Mandala Development Corporation; NIA; USAID. 1991.** Manual for the irrigation system management training of irrigators associations. Quezon City, Philippines NIA. xii, 179p.

*Irrigation management / Farmers' associations / Training / Philippines*

(Location: HQ Call No: IIMI 631.7.8 G732 NIA Record No: H 14228)

14980. **IIMI. SLFO. 1993.** Progress of participatory management: Reconnaissance results. Colombo, Sri Lanka IIMI. xiii, 52p.

*Participatory management / Irrigation management / Farmers' associations / Farmer participation / Evaluation / Monitoring / Sri Lanka / Mahaweli Project*

(Location: HQ Call No: IIMI 631.7.8 G744 IIM Record No: H 15029)

14981. **IIMI. SLFO. 1994.** SCOR gets off the ground. SCOR Monitor, 1(1):1-8.

*Irrigation programs / Natural resources / Watersheds / Resource management / Sri Lanka*

(Location: HQ Call No: P 3456 Record No: H 14589)

14982. **IIMI. SLFO. 1993.** Study on monitoring and evaluation or participatory irrigation system management: Inception report (revised) Colombo, Sri Lanka: IIMI. vii, 79p.

*Participatory management / Irrigation management / Privatization / Farmers' associations / Farmer participation / Evaluation / Monitoring / Sri Lanka / Mahaweli Project*

(Location: HQ Call No: IIMI 631.7.8 G744 IIM Record No: H 15028)

**Abstract:** Revised and expanded version of the Inception Report for the Study on Monitoring and Evaluation of the Participatory Irrigation System Policy (TA 1705 SRI), December 1992.

14983. **Ijjas, I. 1994.** Decision support systems. Grid, 4:4-6.

*Irrigation management / Decision making / Water management / Drainage / Flood control / GIS / Computer software*

(Location: HQ Call No: P 3338 Record No: H 14023)

14984. **IPTRID. 1991.** Networking: Bringing professionals together through information exchange. Wallingford, UK: Hydraulics Research. 18p.

*Irrigation management / Drainage / Information systems / Networks*

(Location: HQ Call No: P 3534 Record No: H 14759)

14985. **ISPAN. 1994.** Future directions for implementing water policy: Report on a USAID sponsored workshop, 28-29 April 1994. xii, 55p.

*Water policy / Water rights / Water users' associations / Pricing / Cost recovery / Waste waters / Water reuse*

(Location: HQ Call No: 631.7.8 G000 ISP Record No: H 14478)

**Note:** Workshop held at the University of Maryland University College Conference Center, Maryland, USA, 28-29 April 1994.

14986. **ISPAN. 1994.** ISPAN lessons learned paper. In USAID. Asia and Near East Bureau; ISPAN, Future directions for implementing water policy. A workshop held at the University of Maryland University College Conference Center, Maryland, USA, 28-29 April 1994. 13p.

*Cost recovery / Water quality / Water management / Water delivery / Flood water / Water rights / Environmental effects / Water policy / Asia / Middle East*

(Location: HQ Call No: 631.7.8 G000 USA Record No: H 14485)

14987. **JICA. 1987.** Feasibility study on the Tanjong Karang Irrigation Development and Management Project. Final project report prepared by JICA for consideration by the Government of Malaysia in implementing irrigation development and management to overcome water-related problems prevailing in the project area. 2 vols.; x, 131p. + annexes.

*Irrigation management / Water management / Project appraisal / Development projects / Feasibility studies / Malaysia*

(Location: HQ Call No: 631.7.8 G714 JIC Record No: H 13828)

14988. **JICA; FAO. RAPA. 1994.** Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand FAO. RAPA. v, 289p. (RAPA publication 1994/17)

*Performance evaluation / Irrigation management / Water management / Sustainable agriculture / Environmental effects / Drought / Information / Networks / Irrigation systems / Irrigation operation / Maintenance / Asia / Thailand / Bangladesh / Bhutan / China / India / Indonesia / Korea Republic / Malaysia / Myanmar / Nepal / Pakistan / Philippines / Sri Lanka / Vietnam*

(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15196)

14989. **Johnson, S.H.; Vermillion, D.L. 1987.** Irrigation management in Indonesia. Report prepared for presenta-

tion at the Center for Agricultural Economics Research, Bogor, Indonesia, 12 October 1987. 83p.

*Irrigation management / Agricultural production / Agricultural development / Water distribution / Water delivery performance / Water requirements / Maintenance / Crops / Diversification / Farmer participation / Decision making / Water allocation / Monitoring / Water rates / Training needs assessment / Indonesia*

(Location: HQ Call No: IIMI 631.7.8 G662 JOH Record No: H 15035)

14990. **Johnson, S.H.; Svendsen, M.; Zhang, X. 1994.** Performance impacts of transfer. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20–24 September 1994. Vol.3. Draft conference papers. pp.103–124.

*Irrigation management / Privatization / Economic aspects / Water rates / Agricultural production / Financing / China*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15557)

14991. **Jones, L.D. 1993.** Review of performance criteria of the irrigation systems in the Murray Darling Basin in Australia. Catchment Management Services Group, Hydrotechnology, Rural Water Corporation, Melbourne, Victoria, Australia, Report No.1993/60. 28p.

*River basin development / Performance evaluation / Performance indexes / Irrigation systems / History / Irrigation efficiency / Economic aspects / Australia / Victoria / Queensland / New South Wales*

(Location: HQ Call No: P 3291 Record No: H 13884)

14992. **Juriëns, R. 1993.** Protective irrigation: Essence and implications. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI–R35: Planning and design of irrigation and drainage systems. pp.333–348.

*Protective irrigation / Irrigation design / Water demand / Water availability / Irrigation requirements / Agricultural development / Rice / India / Pakistan*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15087)

14993. **Jurriëns, M. 1992.** Monitoring of irrigation system operation. In Feyen, J.; Mwendera, E.; Badji, M.(Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14–17 September 1992. Vol. 2. Leuven, Belgium: Center for Irrigation Engineering. pp.515–523.

*Irrigation systems / Irrigation operation / Monitoring / Water delivery / Water distribution / Performance indexes / Water loss / Water use efficiency*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14432)

14994. **Kaewkulaya, J. 1994.** Thailand. In Heim, F.; Abenethy, C.L. (Eds.), Irrigated agriculture in Southeast Asia beyond 2000: Proceedings of a Workshop held at Langkawi, Malaysia, 5 to 9 October 1992. Colombo, Sri Lanka: IIMI; DSE. pp.43–55.

*Irrigated farming / Crops / Diversification / Land use / Water availability / Water use / Irrigation management / Policy / Thailand*

(Location: HQ Call No: IIMI 631.7.8 G800 HEI Record No: H 15266)

14995. **Kaide, Y.; Baoquan, H. 1991.** Centrized water resources management in an irrigation district. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.339–346.

*Water resource management / Irrigation management / Water use efficiency / China*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14939)

14996. **Karunasena, H.A. 1994.** Participatory action research to improve the performance of jointly managed irrigation systems. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20–24 September 1994. Draft conference papers. Vol.1. pp.81–91.

*Irrigation management / Agricultural research / Research policy / Irrigation systems / Performance / Farmer participation / Participatory management / Sri Lanka / Kirindi Oya / Uda Walawe*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15418)

14997. **Kazaure, Y. 1994.** HJRBDA-IIMI collaborative action research in Kano River Irrigation Project (KRIP) In Pradhan, P.; Abdulmumin, S. (Eds.), Participatory irrigation management in Nigeria: Proceedings of a National Seminar held at National Water Resources Institute, Kaduna, Nigeria, 9–10 November 1993. Kaduna, Nigeria: NWRI. pp.18–27.

*Participatory management / Irrigation management / Farmer participation / Research / River basin development / Nigeria*

(Location: HQ Call No: IIMI 631.7.8 G214 PRA Record No: H 14950)

14998. **Keller, J. 1992.** Irrigation scheme design for sustainability. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the

Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.217-234.

*Irrigation management / Development policy / Sustainability / Irrigation programs / Project planning / Irrigated farming / Economic analysis / Decision making*

(Location: HQ Call No: 631.7.1 G000 FEY Record No: H 14351)

**Abstract:** This paper has been developed to provide a holistic framework outlining conditions for designing sustainable irrigation schemes and the on-farm systems therein. The watershed, the water supply, and the agricultural domains must be carefully planned and designed for sustainability and continue to function adequately for an irrigation scheme to prosper. Some of the main reasons irrigation schemes fail are: inadequate or decreased quantity or quality of the water supply; salinization, alkalization, or water logging of the irrigated soils; degradation of the water supply system due to poor design and maintenance; undependable water deliveries to farmers due to poor design and ineffective management of the water supply system; and ineffective on-farm irrigation facilities due to poor system selection and design and inadequate support and economic incentives for farmers. The paper begins by considering the design implications related to irrigation scheme sustainability. Then the focus is shifted to the selection and application of modern on-farm irrigation systems.

14999. Keller, J.; Peabody, N.S.; Seckler, D.; Wichelns, D. 1992. Water policy innovations in California. Water resource management in a closing water system. A discussion paper by Winrock International's Water Resource and Irrigation Policy Program on managing competition for scarce water supplies. vii, 49p. (Discussion paper no.2)

*Water policy / Water resource management / Water conservation / Water storage / USA / California*

(Location: HQ Call No: P 3426 Record No: H 14534)

15000. Khan, H.R. 1994. Some issues in irrigation development in Bangladesh. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.79-94.

*Irrigation programs / Flood control / Drainage / Tube wells / Bangladesh*

(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15203)

15001. Khan, M.Y. 1991. Irrigation water management in Indus River System of Pakistan. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.298-311.

*Water management / Water allocation / Reservoirs / River basin development / Irrigation canals / Flow control / Flood control / Government managed irrigation systems / Pakistan / Indus River*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14935)

15002. Kishore, K. 1994. A million arguments against mega-projects. Panoscope, 39:4.

*Water resources / Irrigation programs / Performance / India*

(Location: HQ Call No: P 3504 Record No: H 14654)

15003. Kodai, S.; Benli, E. 1993. Research and development on irrigation and drainage technologies in Turkey. In FAO, Integrated rural water management: Proceedings of the Technical Consultation on Integrated Rural Water Management, Rome, Italy, 15-19 March 1993. Rome, Italy: FAO. pp.163-174.

*Irrigation / Technology / Research / Development projects / Water resources / Land resources / Turkey / Anatolia*

(Location: HQ Call No: 333.91 G000 FAO Record No: H 14151)

15004. Kolavalli, S.; Kalro, A.H.; Naik, G.; Shah, N. 1993? Management of irrigation systems: The case of Meshwo and Pophal in Gujarat, India. Report of a study undertaken at the Center for Management in Agriculture, Indian Institute of Management, Ahmedabad, India, with support from IFPRI. 52p. + annexes.

*Irrigation management / Irrigation systems / Case studies / Reservoirs / Simulation / Decision making / India / Gujarat*

(Location: HQ Call No: P 3429 Record No: H 14548)

15005. Kolawole, A.; Ambi, Y.A.; Omokore, D.F. 1994. Problems and prospects in participatory irrigation management in Nigeria. In Pradhan, P.; Abdulmumin, S. (Eds.), Participatory irrigation management in Nigeria: Proceedings of a National Seminar held at National Water Resources Institute, Kaduna, Nigeria, 9-10 November 1993. Kaduna, Nigeria: NWRI. pp.64-66.

*Participatory management / Irrigation management / Farmer participation / Nigeria*

(Location: HQ Call No: IIMI 631.7.8 G214 PRA Record No: H 14958)

15006. Kotagama, H.B.; Smith, L.; Carruthers, I.D. 1992. Identification and estimation of priority weights of irrigation system management objectives for irrigation

system performance assessment. Tropical Agricultural Research, 4:297-307.

*Irrigation management / Performance evaluation / Investment / Decision making / Sri Lanka*

(Location: HQ Call No: P 3629 Record No: H 12641)

15007. **Kulshreshtha, S.N. 1991.** Project evaluation in the context of planning irrigation projects. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-A: Irrigation planning. New Delhi, India: ICID. pp.11-22.

*Irrigation programs / Project appraisal / Economic evaluation / Cost benefit analysis / Regional development / Environmental effects*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14887)

15008. **Kyi, K.M. 1991?** Data availability for measuring system performance in irrigation management. Report written to inform about the conditions of data availability in some of the prospective countries in which the main field research (a Pilot Testing and a Sample Survey for Introducing Systems of Indicators) of Performance Evaluation Project will be conducted. 24p.

*Irrigation management / Performance evaluation / Research / Data collection / Indicators / Surveys / India / Sudan / Sri Lanka / Philippines*

(Location: HQ Call No: IIMI 631.7.8 G000 KYI Record No: H 13755)

15009. **Kyi, K.M.; Svendsen, M. 1990.** Papers on performance evaluation of irrigation systems: Contributions towards the development of an analytical framework and a methodology. 31p.

*Irrigation management / Performance evaluation / Methodology*

(Location: HQ Call No: IIMI 631.7.8 G000 KYI Record No: H 13752)

**Abstract:** Papers originally read and discussed in a "Symposium on the Performance of Irrigation Systems," held at IIMI, Colombo, Sri Lanka, as a part of the Institute's Annual Internal Program Review, 23 November 1990.

15010. **Lantin, M.M. 1994.** Comments on the paper "Institutional adaptation and institutional change" In Heim, F.; Abernethy, C.L. (Eds.), Irrigated agriculture in South-east Asia beyond 2000: Proceedings of a Workshop held at Langkawi, Malaysia, 5 to 9 October 1992. Colombo, Sri Lanka: IIMI; DSE. pp.113-114.

*Irrigation management / Institution building / Organizational change / Irrigated farming / Decentralization / Privatization / South East Asia / Philippines*

(Location: HQ Call No: IIMI 631.7.8 G800 HEI Record No: H 15274)

15011. **Levine, G.; Garces-Restrepo, C. 1994.** Observaciones desde afuera: Una mirada a sistemas de riego

transferidos en Mexico. [Observations from the outside: A look at transferred irrigation systems in Mexico] In Vélez, E.P.; Garcia, A.E.; Panta, J.E.R.; Saenz, E.M.; Barrios, J.M.D. (Eds.) Seminario Internacional sobre la Transferencia de los Sistemas de Riego, Ciudad Obregon, Mexico, 4-7 May 1994. Montecillo, México: Colegio de Postgraduados. pp.101-111.

*Irrigation management / Water users' associations / Water rates / Farmer participation / Economic aspects / Environmental effects / Water allocation / Privatization / Mexico*

(Location: HQ Call No: IIMI 631.7.8 G404 LEV Record No: H 14768)

15012. **Levine, G.; Garces-Restrepo, C. 1994.** Observations from the outside: A look at transferred irrigation systems in Mexico. Paper presented at the Regional Workshop on Transfer of Irrigation Systems, Ciudad Obregon, Mexico, 4-7 May 1994. 11p.

*Irrigation management / Water users' associations / Water rates / Farmer participation / Economic aspects / Environmental effects / Water allocation / Privatization / Mexico*

(Location: HQ Call No: IIMI 631.7.8 G404 LEV Record No: H 14767)

15013. **Liu, C.; Mou, H.; Ma, Q.; Johnson, S.H. 1994.** Changes in irrigation as a result of policy reforms in China: A case study of North China. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.143-151.

*Irrigation management / Policy / Agricultural development / Case studies / Institutions / Water law / Water rates / Maintenance / China*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15561)

15014. **Liu, F. 1991.** Increasing irrigation benefits through the improvement of management. In ICID, The Special Technical Session: Proceedings, Beijing, China, April 1991. Vol.1-C: Irrigation management. New Delhi, India: ICID. pp.323-328.

*Irrigation management / Management innovations / Water conservation / Water use efficiency / Irrigation canals / China*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14937)

15015. **Malano, H.M.; Boonlue, C.; McMahon, T.A. 1993.** Developing an improved operational strategy for the Thup-Salao irrigation system, Thailand. Irrigation and Drainage Systems, 7(3):205-220.

*Irrigation operation / Strategy planning / Irrigation scheduling / Simulation models / Computer techniques / Monitoring / Reservoir operation / Thailand*

(Location: HQ Call No: PER Record No: H 12025)

**Abstract:** A combined monitoring-modelling analysis of the past operation of the Thup Salao irrigation scheme (Thailand) is performed with a view to developing an improved operational strategy. The IMSOP computer model was used to simulate the operation of the delivery system using monitoring operational data since its commissioning (1988-1991). Temporal deviations of up to 80% are observed between the planned irrigation supply, the requirement irrigation delivery and the actual irrigation delivery in the wet season and up to 20% in the dry season. A real-time rainfall adjustment of the planned delivery scheduling resulted in a substantial improvement in the ability to match crop water demand and use rainfall more effectively. This suggests that a dual scheduling strategy consisting of seasonal (tactical) planning and real-time adjustment is required to improve operational performance.

15016. **Marandy, J.; Koudstaal, R.; Salam, M.A.; de Graaf, L.; Lundström, W. 1993.** Application of rapid rural appraisal in the preparation of small scale water sector schemes in Bangladesh. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.417-435.

*Irrigation programs / Small scale systems / Water resources / Rapid rural appraisal / Flood control / Drainage / Agricultural production / Bangladesh*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15093)

15017. **Maurya, P.R.; Ibrahim, M.H. 1993.** Irrigation development and management in Nigeria. Q.45, R.4, ICID 15th Congress, The Hague, Netherlands, 1993. pp.67-82.

*Irrigation programs / Irrigation systems / Irrigation management / River basin development / History / Nigeria*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 13748)

**Abstract:** The setting up of the River Basin Development Authorities (RBDAs) between 1975-76 and the World Bank assisted Agricultural Development Projects (ADPs) between 1980-86 were the milestone in the development of large scale irrigation schemes and of irrigated fadama (alluvial river bed), respectively in Nigeria. The developments of large scale irrigation projects in Nigeria were very fast in the first decade of the establishment of the RBDAs and later slowed down due to severe shortage of funds, total dependency of RBDAs on government grants, and non-participation of farmers in the project. Ultimately, the overall performance of the project declined sharply. And then the government's

attention was diverted towards the small scale irrigation development through the exploitation of shallow groundwater in the fadama area under the ADP. Presently, a little over 100,000 hectares of land is under modern medium-large scale irrigation and around 181,000 hectares fadama under small-medium scale irrigation in the country. However if the existing water reservoirs are fully exploited and water efficiently used, the irrigated land could be increased by 3 to 4 fold. Presently the overall irrigation efficiency range is between 25-35 percent and 50-60 percent in surface and sprinkler irrigation systems, respectively. Most of the irrigation projects in the country suffer from the common problem of low water utilization efficiency, low productivity, and prominent head and tail effects caused by inadequate attention on operation and maintenance and effective farmer organizations. The irrigation water use for various crops varies in the region on one hand and on the other the choice of crops to be grown, cropping pattern and their intensity generally develop over the year on the basis of availability of water at farms. Therefore, the success and failure of any irrigation project depends ultimately on the productivity and the net return to farmers, which signifies the overall management performance of the irrigation system. This paper is aimed at examining the historical and current development of irrigation in Nigeria as well as the recent policy on management of the irrigation schemes.

15018. **Meigh, D.; Stacey, D. 1993.** Matching intake design for small schemes to potential benefits. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.63-76.

*Small scale systems / Irrigation design / Weirs / Construction costs / Cost benefit analysis / Nepal / Indonesia*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15066)

15019. **Mendis, D.L.O. 1993.** A regional water management strategy: The proposed southern area plan in Sri Lanka. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-G, Special session - Irrigation and drainage in competition for water. New Delhi, India: ICID. pp.15-34.

*Irrigation programs / Tank irrigation / Reservoirs / History / Large-scale systems / Design criteria / Water management / Environmental degradation / Sri Lanka*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15719)



15020. Mohandoss, R.; Gomathinayagam, P.; Jayachandran, K.; Pundarikanthan, N.V. 1993. Role of management control process on performance - A case study. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-F, Question 45, R30-R49: Irrigation and drainage systems management - Institutional and financial inter-relationships. New Delhi, India: ICID. pp.665-677.

*Irrigation management / Irrigation systems / Farmer-agency interactions / Rice / Performance evaluation / Decision making / Water delivery / Management control systems / Monitoring / India*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15659)

15021. Mohd Adnan, M.N. 1994. The role of performance assessment in real time system management. Irrigation and Drainage Systems, 7(4):273-289.

*Performance evaluation / Irrigation management / Rice / Malaysia*  
(Location: HQ Call No: PER Record No: H 15505)

15022. Mohtadullah, K. 1992. Research and training needs for stimulating irrigation development. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigation systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol.1. Leuven, Belgium: Center for Irrigation Engineering. pp.3-13.

*Irrigation practices / Training needs assessment / Research / Development policy*  
(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14331)

15023. Mujumdar, P.P.; Vedula, S. 1992. Performance evaluation of an irrigation system under some optimal operating policies. Hydrological Sciences Journal, 37(1):13-26.

*Reservoir operation / Performance evaluation / Simulation / Crop yield / Policy / Indicators / Irrigation systems / India / Karnataka*  
(Location: HQ Call No: P 3454 Record No: H 14585)

15024. Murray-Rust, D.H.; Gulati, O.T.; Sakthivadivel, R.; Prajapati, V.B.; Shukla, P.L. 1994. Improving irrigation performance through the use of management information systems: The case of Mahi Kadana, Gujarat, India. Colombo, Sri Lanka IIMI. xix, 85p. (IIMI country paper - India no.1)

*Water management / Water distribution / Cropping systems / Rotation / Performance evaluation / Performance indexes / Data collection*

*/ Databases / Canal irrigation / Management Information Systems / India / Gujarat*  
(Location: HQ Call No: IIMI 631.7.8 G642 MUR  
Record No: H 14695)

15025. Murty, V.V.N.; Takeuchi, K. 1994. Overview of irrigation performance and evaluation in the Asia Pacific Region. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.18-39.

*Performance evaluation / Performance indexes / Irrigation management / Water delivery / Irrigation systems / Asia / Pacific Islands*  
(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15198)

15026. Musa, I.K.; Adewole, A.O.; Aduragbe, T.A. 1994. Issues in participatory irrigation management: Case studies of Tungan Kawo and Tada Shonga Irrigation Systems from Niger River Basin Development Authority. In Pradhan, P.; Abdulmumin, S. (Eds.), Participatory irrigation management in Nigeria: Proceedings of a National Seminar held at National Water Resources Institute, Kaduna, Nigeria, 9-10 November 1993. Kaduna, Nigeria: NWRI. pp.74-76.

*Participatory management / Irrigation management / Farmer participation / Water users' associations / Irrigation programs / Case studies / Nigeria / Niger River*  
(Location: HQ Call No: IIMI 631.7.8 G214 PRA  
Record No: H 14961)

15027. Musa, I.K. 1994. Policy aspects on participatory irrigation management. In Pradhan, P.; Abdulmumin, S. (Eds.), Participatory irrigation management in Nigeria: Proceedings of a National Seminar held at National Water Resources Institute, Kaduna, Nigeria, 9-10 November 1993. Kaduna, Nigeria: NWRI. pp.13-17.

*Participatory management / Irrigation management / Farmer participation / Policy / Water users' associations / Nigeria*  
(Location: HQ Call No: IIMI 631.7.8 G214 PRA  
Record No: H 14949)

15028. Mwendera, E.J. 1992. Marrying irrigation development with sustainable land use: Conference summary. In Feyen, J.; Mwendera, E.; Badji, M. (Eds.), Advances in planning, design and management of irrigations systems as related to sustainable land use: Proceedings of an International Conference organized by the Center for Irrigation Engineering of the Katholieke Universiteit Leuven in cooperation with the European Committee for Water Resources Management, Leuven, Belgium, 14-17 September 1992. Vol. 3. Leuven, Belgium: Center for Irrigation Engineering. pp.975-986.

*Land use / Irrigation management / Water management / Farmer participation / Agricultural*

*research / Training / Development / Sustainability / Conferences*

(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14477)

15029. **Nagata, K. 1994.** Evolution of land improvement districts in Japan. Colombo, Sri Lanka IIMI. v, 16p. (Short report series on locally managed irrigation no.6)

*Irrigation management / Farmer managed irrigation systems / Land development / Legal aspects / Legislation / Water users' associations / Japan*

(Location: HQ Call No: IIMI 631.7.8 G696 NAG  
Record No: H 14764)

15030. **Nakkawita, W. 1994.** Irrigation scheme leaves fields drier than before. *Panoscope*, 39:2-4.

*Irrigation programs / Performance / Irrigated farming / Water scarcity / Large-scale systems / Sri Lanka / Mahaweli Project*

(Location: HQ Call No: P 3504 Record No: H 14653)

15031. **Narayana, D.; Nair, K.N. 1994.** Tenancy in the context of irrigation uncertainty: Role of the leading input in shaping institutions. *Economic and Political Weekly*, 29(39):A129-A134.

*Irrigation management / Tenancy / Rice / Bananas / Rain / Villages / India / Tamil Nadu / Kanyakumari District*

(Location: HQ, ODI Call No: P 3626 Record No: H 11930)

15032. **Navalawala, B.N. 1994.** Planning perspective of farmers' participation in irrigation management in India. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.161-174.

*Farmer participation / Irrigation management / Planning / Water use efficiency / Economic aspects / Water users' associations / Legal aspects / Water policy / Women / India*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15563)

15033. **Nepal. Ministry of Water Resources. Department of Irrigation, Hydrology and Meteorology. 1988.** Irrigation Management Project, trimester report no.7 (16 July-15 November 1988) Progress report of a joint project of the Government of Nepal and USAID with technical assistance provided by Louis Berger International Inc., Cornell University and EAST Consult. v.p.

*Irrigation management / Irrigation programs / Project appraisal / Project management / Monitoring / Evaluation / Farmers' attitudes / Farmer participation / Water users' associations / Training / Nepal*

(Location: HQ Call No: P 3289 Record No: H 13847)

15034. **Ngion, K.C. 1994.** Improved irrigation/water management for sustainable agricultural development in Malaysia. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.151-160.

*Irrigation management / Water management / Sustainable agriculture / Agricultural development / Rice / Agricultural production / Monitoring / Irrigation programs / Performance evaluation / Water harvesting / Irrigated farming / Malaysia*

(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15210)

15035. **NIA; IIMI. Philippines. 1991.** Manual on designing and managing training programs. Quezon City, Philippines: NIA. x, 200p.

*Training and development / Training needs assessment / Philippines*

(Location: HQ Call No: IIMI 631.7.8 G732 NIA  
Record No: H 14230)

15036. **Norris, J.H.M. 1991.** Water management in agriculture. *Irrigation News*, No.19 Autumn:13-19.

*Water management*

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15037. **Nyunt, K.M. 1994.** Irrigation/water management for sustainable agricultural development in Myanmar. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.161-178.

*Irrigation management / Water management / Constraints / Sustainable agriculture / Agricultural development / Agricultural production / Watershed management / Performance evaluation / Water resources / Farmer participation / Myanmar*

(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15211)

15038. **Oskam, R. 1994.** Evaluation of decision-support systems for water management in irrigation systems in Sri Lanka. In Haq, K.A.; Rey, J.; Sakthivadivel, R.; Samarasakera, B.M.S. (Eds.), Use of computer-operated models as decision-support tools in operation and management of irrigation systems: Sri Lankan experience - Proceedings of the Workshop on the Use of Computer-Operated Models as Decision-Support Tools in Operation and Management of Irrigation Systems held in Galgamuwa, Sri Lanka from 15 to 16 July 1993. Colombo, Sri Lanka: IIMI. pp.19-20.

*Decision support tools / Irrigation management / Irrigation systems / Performance evaluation / Computer models / Water management / Irrigation scheduling / Sri Lanka / Kirindi Oya / Kantale / Hakwatuna Oya Project*

- (*Location:* HQ *Call No:* IIMI 631.7.1 G744 HAQ *Record No:* H 15125)
15039. **Ostrom, E.; Gardner, R. 1993.** Coping with asymmetries in the commons: Self-governing irrigation systems can work. *Journal of Economic Perspectives*, 7(4):93-112.  
*Irrigation management / Farmer managed irrigation systems / Case studies / Nepal*  
(*Location:* HQ *Call No:* P 3340 *Record No:* H 14047)
15040. **Pai, A.A. 1992.** India National Water Management Project. Supervision report, World Bank Mission, January-June 1992. 16p. + annexes.  
*Water management / Irrigation management / Development projects / Irrigation programs / India*  
(*Location:* HQ *Call No:* P 3272 *Record No:* H 13750)
15041. **Pakistan National Committee of ICID. 1991.** Irrigation and drainage development in Pakistan. New Delhi, India: ICID. ii, 38p. (Asia year 1991 country report)  
*Irrigation systems / Drainage / History / Water potential / River basins / Waterlogging / Soil salinity / Pakistan*  
(*Location:* HQ *Call No:* 631.7.8 G730 PAK *Record No:* H 15032)
15042. **Palanisami, K. 1994.** Management of tank and well water under constraints. Paper prepared for IFPRI/ICAR Workshop on Agricultural Growth in India, New Delhi, India, 1-6 May 1994. 24p.  
*Tank irrigation / Tube wells / Irrigation management / Rice / Supplementary irrigation / Groundwater management / India / Tamil Nadu*  
(*Location:* HQ *Call No:* P 3443 *Record No:* H 14573)
15043. **Parasuraman, S. 1993.** The anti-Narmada project movement in India: Can the resettlement and rehabilitation policy gains be translated into a national policy. The Hague, Netherlands: Institute of Social Studies. 35p. (Institute of Social Studies working paper no.161)  
*Settlement / Irrigation management / Rehabilitation / Policy / Non-governmental organizations / India / Gujarat / Narmada Project*  
(*Location:* ODI *Call No:* R-ISS WP 161 *Record No:* L 942851)
15044. **Pereira, N. 1994.** Irrigation policies and irrigation management transfer programs in Chile. IIMI; Wuhan University of Hydraulic and Electrical Engineering, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Draft conference papers. Vol.1. pp.165-172.  
*Irrigation management / Privatization / Water policy / Water law / Farmer participation / Cost recovery / Institutions / Chile*  
(*Location:* HQ *Call No:* IIMI 631.7.3 G000 IIM *Record No:* H 15426)
15045. **Peterson, D.F.; Stains, E.D. 1981.** Irrigation use and water management. *Journal of Indian Water Resources Society*, 1(3):11-17.  
*Irrigation systems / Irrigation management / Risks*  
(*Location:* ODI *Call No:* ODI Journals *Record No:* L 942444)
15046. **Pheddara, P. 1994.** Irrigation/water management for sustainable agricultural development in Lao PDR. In JICA; FAO. RAPA. Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.143-150.  
*Irrigation management / Water management / Sustainable agriculture / Agricultural development / Land use / Irrigation programs / Rice / Laos / South East Asia*  
(*Location:* HQ *Call No:* 631.7.8 G570 JIC *Record No:* H 15209)
15047. **Plusquellec, H. 1994.** The value of performance studies of irrigation projects for lending agencies. *Irrigation and Drainage Systems*, 7(4):263-271.  
*Performance evaluation / Irrigation programs / Financial institutions / Development aid*  
(*Location:* HQ *Call No:* PER *Record No:* H 15504)  
*Abstract:* This paper looks at the World Bank's experience with irrigation and drainage projects and compares their performance expected at appraisal stage with the performance re-assessed at completion and at the time of impact evaluation, typically 3 to 5 years later when projects have reached their full potential. This review confirms the over-optimistic assumptions of project performance at appraisal and completion stages. The deficiencies in water distribution are far greater than suspected, affecting cropping intensity and crop yields much more than originally thought. An important lesson from this memo is the need to adopt more realistic values of key parameters in the preparation of irrigation projects.
15048. **Pouya, A.M. 1994.** Des paysans se ressource au- pres d'autres paysans au Burkina Faso. *Bulletin du Réseau Irrigation Afrique de l'Ouest*, No.4:3-7.  
*Irrigation management / Farmer participation / Extension / Burkina Faso*  
(*Location:* HQ *Call No:* PER *Record No:* H 14575)
15049. **Pradhan, P.; Abdulmumin, S. (Eds.) 1994.** Participatory irrigation management in Nigeria: Proceedings of a National Seminar held at National Water Resources Institute, Kaduna, Nigeria, 9-10 November 1993. Kaduna, Nigeria: NWRI. viii, 88p. (IIMI/NWRI seminar paper 1994)  
*Irrigation management / Participatory management / Policy / Cooperatives / Farmer*

*participation / Non-governmental organizations / Water users' associations / Land ownership / Irrigation programs / Case studies / Nigeria*  
(Location: HQ Call No: IIMI 631.7.8 G214 PRA  
Record No: H 14947)

15050. **Pradhan, P.; Abdulmumin, S.; Ben-Musa, S. 1994.** Participatory irrigation management in the context of Nigeria. In Pradhan, P.; Abdulmumin, S. (Eds.), Participatory irrigation management in Nigeria: Proceedings of a National Seminar held at National Water Resources Institute, Kaduna, Nigeria, 9-10 November 1993. Kaduna, Nigeria: NWRI. pp.1-12.

*Participatory management / Irrigation management / Farmer participation / Policy / Water users' associations / Farmer-agency interactions / Decision making / Nigeria*  
(Location: HQ Call No: IIMI 631.7.8 G214 PRA  
Record No: H 14948)

15051. **Prechawit, C. 1994.** Irrigation/water management in Thailand: Focusing on 1994 drought. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.50-55.

*Irrigation management / Water management / Drought / Water allocation / Water availability / Reservoirs / Thailand*  
(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15200)

15052. **Priest, J.E.; Badr-Ud-Din, M. 1993.** An organization for high agricultural productivity riverain areas, Pakistan. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993. Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.169-180.

*Irrigated farming / Organizations / Financing / Farmer participation / Tube wells / Pakistan / Punjab*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15075)

15053. **Project Coordination Committee. Fordwah Eastern Sadiquia (South) Irrigation and Drainage Project. Umbrella Technical Group. 1994.** Integrated research plan for Fordwah Eastern Sadiquia (South) Irrigation and Drainage Project. Report prepared by Umbrella Technical Group. 106p.

*Irrigation management / Drainage / Research / Environment / Monitoring / Waterlogging / Watercourses / Performance evaluation / Hydrology / Agriculture / Salinity / Agronomy / Pakistan*  
(Location: HQ Call No: 631.7.8 G730 PRO  
Record No: H 12649)

15054. **Punyaraj, P. 1994.** Sustainable operation and management improvement of the Phitsanulok Project. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.237-252.

*Irrigation management / Irrigation systems / Irrigation programs / Irrigation canals / Computer models / Management Information Systems / Thailand / Phitsanulok Project*  
(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15217)

15055. **Pusposutardjo, S.; Soetrisno, L. 1994.** Indonesia. In Heim, F.; Abernethy, C.L. (Eds.), Irrigated agriculture in Southeast Asia beyond 2000: Proceedings of a Workshop held at Langkawi, Malaysia, 5 to 9 October 1992. Colombo, Sri Lanka: IIMI; DSE. pp.3-17.

*Irrigation systems / Irrigation management / Rice / Environmental effects / Agricultural policy / Indonesia / Java*  
(Location: HQ Call No: IIMI 631.7.8 G800 HEI  
Record No: H 15263)

15056. **Pusposutardjo, S. 1990.** Linking research finding to managers, planners, and policy makers. Paper presented at the Workshop on Irrigation Management Improvement in Rice-based Cropping Systems, 13-14 June 1990, Yogyakarta, Indonesia. i, 17p.

*Irrigation management / Planning / Agricultural research / Agricultural policy / Crop-based irrigation / Technology transfer / Indonesia*  
(Location: HQ Call No: IIMI 631.7.8 G662 PUS  
Record No: H 15183)

15057. **Radevski, A. 1993.** L'irrigation en Macedoine et les possibilites de construire des systemes nouveaux. [Irrigation in Macedonia and possibilities of construction of new systems] In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993. Water management in the next century. Transactions: Vol.1-B, Question 44, R36-R72. Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.939-949.

*Irrigation systems / Agricultural development / Macedonia*  
(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15257)

15058. **Rajan, A.P.; Pundarikanthan, N.V. 1993.** Water distribution evaluation of a South Indian system - A case study. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993. Water management in the next century: Transactions: Vol.1-C, Question 44, R73-R103: Planning and design of irrigation and drainage systems. New Delhi, India: ICID. pp.1007-1015.

*Water distribution / Performance evaluation / Case studies / Irrigation management / Rivers / India / Tamil Nadu*

(Location: HQ Call No: ICID 631.7 G000 ICI  
Record No: H 15334)

15059. **Ramirez, J. 1994.** Irrigation investment and management transfer in Colombia. In IIMI, International Conference on Irrigation Management Transfer, Wuhan, China, 20-24 September 1994. Vol.3. Draft conference papers. pp.197-203.

*Irrigation management / Privatization / Legislation / Policy / Water users' associations / Constraints / Investment / Colombia*

(Location: HQ Call No: IIMI 631.7.3 G000 IIM  
Record No: H 15566)

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*Farmer managed irrigation systems / Decision making / Farmers' associations / Nepal*

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*Irrigation management / Organizational development / Water policy / Legislation / Irrigated farming / Water users' associations / India*

(Location: HQ Call No: 631.7.8 G635 RAN  
Record No: H 14258)

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*Irrigation management / Organizational development / Water policy / Irrigated farming / Maintenance / Water users' associations / Privatization / India*

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*Irrigation / History / Portugal*

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(Location: HQ Call No: IIMI 631.7.3 G000 IIM Record No: H 15568)

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(Location: HQ Call No: P 3631 Record No: H 12643)

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*Irrigation management / Sustainable agriculture / Developing countries / India*  
(Location: HQ Call No: 631.7.1 G000 FEY  
Record No: H 14333)

**Abstract:** The objective of this paper is to bring out the irrigation development planning for Sustainability (in irrigation and agriculture) in the developing countries (based on the experiences in India). The strategies have both short and long term processes. The short term will include 'On Farm Development Works' and canal and tank irrigation systems including conjunctive use of

surface and ground water simultaneously, diversification of crop and cropping pattern, introducing sprinkler irrigation for all closely spaced crops except rice, and adopting water management practices for rice. The well irrigated areas maintain the water table without over exploitation and introduce drip irrigation for wide spaced high value crops, after selecting suitable crop and cropping pattern. The long term measures include National Water Grid by connecting the river system to mitigate floods and droughts, considering water as an economic good for Sustainability and involve grass root level people in planning and management of irrigation projects. Based on research studies conducted and experiences, the trade off between agriculture, domestic and industrial purposes should be worked out. The policy in water and use should be framed to have a sustainable agriculture and irrigation in the future.

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*Irrigation management / Small scale systems / Drip irrigation / Water use efficiency / India*  
(Location: HQ Call No: PER Record No: H 15512)

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*Performance / Irrigation management / Water management / Food production / Agricultural production / Irrigated farming*  
(Location: HQ Call No: IIMI 631.7.8 G000 SKO Record No: H 12935)

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*Irrigation management / Irrigation systems / Agricultural production / Asia*  
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*Small scale systems / Technology transfer*  
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*Irrigation systems / Water requirements / Crop production / Evapotranspiration / Rain / Water distribution / Irrigation programs / Case studies / India / Maharashtra*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14902)

15096. **Sri Lanka. Irrigation Department. IRMU; IIMI. SLFO. 1994.** Summaries of papers presented at Irrigation Research Management Unit Seminars during 1992-93. Colombo, Sri Lanka IRMU. v, 17p.

*Irrigation management / Agricultural research / Sri Lanka / Pakistan*

(Location: HQ Call No: IIMI 631.7.8 G744 SRI Record No: H 15053)

15097. **Strosser, P.; Kuper, M.; Bandaragoda, D.J.; Skogerboe, G.V. 1994.** IIMI research program in Pakistan. Report prepared for Internal Program Review, IIMI, Colombo, Sri Lanka, 7-10 November 1994, and Pakistan Consultative Committee, IIMI, Lahore, Pakistan, 16 November 1994. 33p.

*Irrigation management / Sustainability / Environment / Water management / Research / Drainage / Pakistan*

(Location: HQ Call No: IIMI 631.7.8 G730 STR Record No: H 14208)

15098. **Sufi, A.B.; Ahmad, N.; Zuberi, F.A. 1993.** Improving irrigation and drainage of irrigated lands of the Punjab in view of Water Apportionment Accord of 1991. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.387-402.

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*Performance evaluation / Irrigation systems*

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- (Location: HQ Call No: PER Record No: H 14212)
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*Irrigation management / Farmer managed irrigation systems / Privatization / Irrigation efficiency / Irrigation effects / Project appraisal / Financing / Developing countries / USA / Columbia River*  
(Location: HQ Call No: IIMI 631.7.8 G430 SVE Record No: H 14550)
15102. Svendsen, M. 1992. Sustainability in irrigated agriculture. Rome, Italy: IFAD. 8p. (IFAD technical issues in rural poverty alleviation staff working paper no.10)  
*Sustainability / Irrigated farming*  
(Location: ODI Call No: R-IFAD SWP 10 Record No: L 941793)
15103. Takeuchi, K.; Geijer, J.C.M.A. 1994. Review of network activities in 1992-1994 and proposed network activities in 1994-1996. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.264-274.  
*Irrigation management / Water management / Networks / International cooperation / Asia / Pacific Islands*  
(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15219)
15104. Tilak, M.B.G.; Rajvanshi, B.S. 1991. Operation of irrigation systems in India. In ICID, Special Technical Session Proceedings, Beijing, China, April 1991. Vol.1-B: Operation of irrigation systems. New Delhi, India: ICID. pp.1-13.  
*Irrigation systems / Irrigation management / Water policy / India*  
(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 14726)
15105. Tsutsui, H. 1994. World irrigation IV. Irrigation and environment: Aral Sea Basin in Central Asia. Journal of Irrigation Engineering and Rural Planning, 26:15-30.  
*Water demand / Water supply / Irrigation systems / Irrigation management / Asia / Aral Sea*  
(Location: HQ Call No: PER Record No: H 14379)
15106. Tsutsui, H. 1994. World irrigation V: Food, agriculture and irrigation in the 21st century. Journal of Irrigation Engineering and Rural Planning, 27:4-29.  
*Food supply / Water supply / Water availability / Water distribution / Economic growth / Population / Nutrition / Cereals*
- (Location: HQ Call No: PER Record No: H 15513)
15107. Undan, R.; Galvez, J. 1994. Philippines. In Heim, F.; Abernethy, C.L. (Eds.), Irrigated agriculture in South-east Asia beyond 2000: Proceedings of a Workshop held at Langkawi, Malaysia, 5 to 9 October 1992. Colombo, Sri Lanka: IIMI; DSE. pp.29-42.  
*Water resources / Irrigation systems / Research institutes / Networks / Agricultural production / Irrigation management / Philippines*  
(Location: HQ Call No: IIMI 631.7.8 G800 HEI Record No: H 15265)
15108. Vaidya, Y.L. 1994. Improved irrigation/water management for sustainable agricultural development in Nepal. In JICA; FAO. RAPA, Irrigation performance and evaluation for sustainable agricultural development: Report of The Expert Consultation of the Asian Network on Irrigation/Water Management, Bangkok, Thailand, 16-20 May 1994. Bangkok, Thailand: FAO. RAPA. pp.179-189.  
*Irrigation management / Water management / Constraints / Sustainable agriculture / Agricultural development / Policy / Monitoring / Land use / Performance evaluation / Nepal*  
(Location: HQ Call No: 631.7.8 G570 JIC Record No: H 15212)
15109. Valera, A.; Cablayan, D. 1994. Performance assessment study at Nayom-Bayto Rivers Irrigation System, Philippines. Draft final report prepared for the Performance Program of IIMI. 28p.  
*Performance evaluation / Irrigation systems / Indicators / Rapid methods / Monitoring / Diagnostic analysis / Irrigation management / Philippines*  
(Location: HQ Call No: IIMI 631.7.8 G732 VAL Record No: H 10032)  
**Abstract:** A study of the Nayom-Bayto Rivers Irrigation System (NBRIS) was conducted in 1993. This system is jointly managed by the National Irrigation Administration (NIA) and 14 Irrigators Associations (IAs). The objective of the study is to determine existing performance assessment methodology and performance indicators as used in the NBRIS. The data consisted of secondary sources and also limited primary sources. A rapid appraisal and case study approach were used in the conduct of the study. This study was undertaken as part of the 3 country study (Nepal, Philippines and Sri Lanka) to compare performance assessment methodologies used in these countries. The framework used in the study was based on the work of Bos, et al., 1993. In particular, the management process as applied to irrigation system management is highlighted in this report.
15110. van Dam, J.C. 1993. Simulation of water and solute transport to investigate irrigation management in Punjab, Pakistan. Consultancy report to IIMI-Pakistan, by

author, from Department of Water Resources, Wageningen Agricultural University, December 1993. 31p.

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(Location: HQ Call No: P 2995 Record No: H 13722)

15111. **van de Laar, A. 1993.** Irrigation development, food production and the state in historical perspective. The Hague, Netherlands: Institute of Social Studies. 48p. (Institute of Social Studies working paper no.168)

*Food production / Population / Investment / Water use efficiency / Conflict / River basin development / Environmental effects / Governmental interrelations / Technology / Management / Asia*

(Location: ODI Call No: R-ISS WP 168 Record No: L 942856)

15112. **van de Laar, A. 1993.** Irrigation evaluation, performance measurement and trade-offs between production, efficiency and equity in irrigation investment strategies. The Hague, Netherlands: Institute of Social Studies. 73p. (Institute of Social Studies working paper no.169)

*Agricultural production / Crop yield / Project appraisal / Water management / Legal aspects / Pricing / Groundwater / Common property / Rehabilitation / Modernization / Canal linings / Small scale systems / Rain-fed farming / Irrigation / Policy / Large-scale systems*

(Location: ODI Call No: R-ISS WP 169 Record No: L 942857)

15113. **van de Laar, A. 1993.** Trends in irrigation development and food supplies. In van de Laar, A., Water development for power and irrigation, the environment and sustainable development. The Hague, The Netherlands: Institute of Social Studies. pp.32-61. (Institute of Social Studies. Management of Common Pool Natural Resources Project. Discussion note no.12)

*Irrigation programs / Water resources development / Groundwater / Surface irrigation / Salinity / Waterlogging / Conjunctive use*

(Location: HQ Call No: P 3565 Record No: H 14981)

15114. **van den Toorn, W.H. 1993.** Mekong Delta Master Plan, Viet Nam. Land and Water International, 78:14-16.

*River basin development / Economic policy / Water resources / Vietnam / Cambodia / Mekong River*

(Location: HQ Call No: P 2977 Record No: H 12358)

15115. **van der Vliet, J.; van Achthoven, A.J. 1994.** Irrigation master plan Turkey: An investment strategy for major irrigation development in the period 1992-2001. Land and Water International, 79:10-13.

*Irrigation programs / Project planning / Development policy / Investment planning / Management Information Systems / Turkey*

(Location: HQ Call No: P 3539 Record No: H 14777)

15116. **van Vuren, G. 1993.** Constraints in the use of irrigation efficiency coefficients. In ICID, 15th International Congress on Irrigation and Drainage, The Hague, The Netherlands, 1993: Water management in the next century. Transactions: Vol.1-A, Question 44, RI-R35: Planning and design of irrigation and drainage systems. pp.377-386.

*Irrigation efficiency / Constraints / Irrigation management / Irrigation design / Irrigation programs*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15090)

15117. **Vander Velde, E.J.; Svendsen, M. 1994.** Goals and objectives of irrigation in Pakistan: A prelude to assessing irrigation performance. In IIMI, Pakistan, Tenth progress report on managing irrigation systems to minimize waterlogging and salinity problems. Lahore, Pakistan: IIMI. pp.44.

*Irrigation efficiency / Irrigation operation / Performance evaluation / Research methods / Pakistan*

(Location: HQ Call No: IIMI 631.7.5 G730 IIM Record No: H 14227)

15118. **Vedula, S.; Mohan, S.; Shrestha, V.S. 1986.** Improved operating policies for multipurpose use: A case study of Bhadra Reservoir. Sadhana, 9(3):157-176.

*Reservoir operation / Operating policies / Case studies / Simulation models / Optimization / Hydroelectric schemes / India / Karnataka*

(Location: HQ Call No: P 3519 Record No: H 14708)

15119. **Vedula, S. 1985.** Optimal irrigation planning in river basin development: The case of the Upper Cauvery river basin. Sadhana, 8(2):223-252.

*Irrigation management / River basin development / Reservoirs / Water potential / Case studies / India / Karnataka / Cauvery River*

(Location: HQ Call No: P 3520 Record No: H 14709)

15120. **Vedula, S. 1985.** Planning for irrigation development and management in droughts: Need for a comprehensive study. Paper presented at Seminar on Research and Development Programme for Water Resources in Karnataka, Indian Institute of Science, Bangalore, India, 26-27 February 1985. 8p.

*Drought / Forecasting / Irrigation management / Water policy / India / Karnataka*

(Location: HQ Call No: P 3527 Record No: H 14752)

15121. **Vedula, S. 1983.** Systems techniques applied to river basin problems. In Scientific procedures applied to the planning, design and management of water resources systems: Proceedings of the Hamburg Symposium, August 1983. Wallingford, UK: IAHS. pp.555-564. (IAHS publication no.147)

*River basin development / Reservoirs / Operating policies / Irrigation operation / Diversion / Models / Case studies / India / Cauvery River / Krishna River*

(Location: HQ Call No: P 3526 Record No: H 14751)

15122. **Verhaeghe, R.J.; Sonneveld, J. 1993.** Prospects for improved irrigation water management: The Cidurian case. ICID, 15th International Congress on Irrigation and Drainage, The Hague, Netherlands, 1993: Water management in the next century: Transactions: Vol.1-E, Question 45, R1-R29 - Irrigation and drainage systems management - Institutional and financial inter-relationships. New Delhi, India: ICID. pp.283-304.

*Irrigation management / Irrigation programs / Water management / River basin development / Irrigation operation / Irrigation design / Models / Decision support tools / GIS / Water allocation / Farmer participation / Monitoring / Indonesia*

(Location: HQ Call No: ICID 631.7 G000 ICI Record No: H 15626)

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*Irrigation management / Irrigation systems / Farmer participation / Case studies / India / Pakistan / China*

(Location: HQ Call No: 551.48 G000 AIT Record No: H 13785)

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*Farmer participation / Farmer managed irrigation systems / Irrigation management / Irrigation design / Privatization / Indonesia*

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*Farmer participation / Farmer managed irrigation systems / Irrigation management / Irrigation design / Privatization / Indonesia*

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*Irrigation management / Farmers' associations / Privatization / Water users' associations / Farmer managed irrigation systems / Policy / Farmers' attitudes / Colombia*

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*Risks / Project appraisal / Natural disasters / Water conveyance / Environmental effects / USA*

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*Irrigation management / Water management / Constraints / Sustainable agriculture / Performance evaluation / Agricultural development / Bhutan*

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*Water management / Water delivery / Irrigation scheduling / Water conservation / Farmer participation / USA / California / San Joaquin Valley*

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*Irrigation management / Constraints / Maintenance / Farmers' associations / Water users' associations / Indonesia*

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*Water management / Pricing / Water rates / Economic aspects / Performance evaluation / Irrigation systems / USA / Colorado*

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*Small scale systems / Drip irrigation / Sprinkler irrigation / Germany*

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*Irrigation management / Water management / Water balance / Irrigation requirements / Sprinkler irrigation / Crop yield / Germany*

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*Irrigation development / Water resource management / Investment / Economic analysis / Financial planning / Public sector / Private sector / Institution building / India*

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*Irrigation management / Irrigation operation / Irrigation programs / Performance / Indonesia*

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*Irrigation management / Privatization / Water measurement / Water rates / China*

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*Farmer participation / Irrigation systems / River basin development / Irrigation programs / Irrigation management / China*

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