



參加國際灌溉排水協會第三屆 亞非地區會議報導

行政院農業發展委員會農業資源處工程師

胡 文 章

Wen-jung Hu

一、前 言

國際灌溉排水協會(International Commission on Irrigation and Drainage, ICID) 爲一非政府性之國際科技組織，其功能爲應用新科技促進灌溉、排水、防洪及河川治理等事業之發展，期增加農業生產以解決饑荒問題，及改進全球性之水經理(Water management)問題。協會成立於 1950 年，其雖非政府組織，但在各會員國政府內設有國家委員會(每一國家只能有一國家委員會，我國國家委員會設於經濟部，由水利司長任主席)，現共有76國國家委員會，其中 $\frac{2}{3}$ 爲開發中國家。協會設有總部秘書處於印度新德里，處理協會有關常年行政業務。此外，每年舉行一次執行委員會(每一國家委員會均爲執行委員)，決定年度工作計畫、預算及討論其他有關事項；每三年舉行一次大會，同時由各會員國輪流舉辦區域性會議(不

Subject A

Integration of ground water use in surface irrigation systems to optimize benefits in the existing and planned projects-technical, economic, administrative, legal, environmental and ecological aspects of conjunctive use of surface and ground waters.

- 1 Integration of Surface and Ground Water Use in an Irrigation System-Bundaberg Irrigation Area, Queensland, Australia-B. L. Credlin (Australia)
- 2 Ground Water Utilization for Surface Irrigation-L. A. Krasiltshikov(USSR)
- 3 Systems Approach for Conjunctive Utilization of Irrigation Water-P. B. S. Sarma and N. H. Rao (India)
- 4 Joint Management of Surface and Underground Water Resource-S. M. Semeno-va Yerofoeva, G. P. Kumsiashvili and N. A. Nazarov (USSR)
- 5 Integration of Ground Water and Surface Water is a necessity to Nepal-Dr. Chandra Kant Sharma (Nepal)
- 6 The Role of Ground Water in Irrigation Development in Iraq-Dr. Said Al-Jazairi (Iraq)
- 7 Conjunctive Use Approach for Stabilising Irrigation Water Supply, Depth of

定期)，研討灌溉、排水、及河工等技術專題，出版專題研究報告，供各會員研讀及技術交流。協會成立迄今，30年來對世界水利科技之推展與交流頗多貢獻。

二、國際灌溉排水協會第三屆亞非地區會議

第三屆亞非地區會議由印度國家委員會主辦，於1980年10月23日至10月28日在印度首都新德里舉行。亞非地區共有25國280餘人參加(亞非地區共有42會員國)，研討專題爲：“Management of water in irrigation systems including conjunctive use of surface and ground waters and command area development”(灌溉系統之用水管理，包括地表水及地下水之聯合運用，以及支配地區之開發)。共有論文58篇，在4天會程中分五個中心議題宣讀討論，各中心議題及論文題目如下：

- Water-Table and Agricultural Production in Canal Command Areas-M. C. Agarwal and R. P. Agarwal (India)
- 8 Improvement of Irrigation System in a Typical Alluvial Fan in Japan-A Case in the Tonami District-Shin-ichi Hirose (Japan)
 - 8a Maximising Irrigation Under Existing Systems and Water Bodies in Tamil Nadu by Conjunctive Use of Surface Water and Groundwater Resources-C. A. Srinivasan (India)
 - 9 Planning and Administration for Integration of Surface and Ground Water Irrigation System in Developed Areas for Total Water Management-D. R. Sikka (India)
 - 10 Drainage Water Use for Land Irrigation in the Ukrainian S. S. R.-B. A. Musienko and V. V. Vnuchkov (USSR)
 - 11 Increased Farmers' Benefit through Integration of Groundwater Use in Surface Irrigation System, with Kediri Nganjuk Project as a Case Study-Y. Sudaryoko, Subandi Wirosumarto and Budiman Notoatmodjo (Indonesia)
 - 12 Combined Development of Surface and Ground Water in Madiun Valley-Directorate General (Indonesia)
 - 13 Scope for Ground Water Development in the Chambal Command Area, Rajasthan-K. R. Karanth and Bharat Bhushan (India)
 - 14 Water Resources Management with Conjunctive Operation of Surface and Groundwater Systems-S. C. Patra (India)
 - 15 Conjunctive Use of Surface and Ground Waters-A Case Study of Sri Ramsgar Project in Andhra Pradesh-T. C. Jain and K. M. Subrahmaniyam (India)
 - 16 Augmenting Existing Surface Water Potential of Tamil Nadu-Scope and Suggestions-G. Ganapathisubramanian and T. Joseph Gnanadass (India)
 - 17 Artificial Ground Water Recharge-A Technique for Water Resources Management in the Sudan-Dr. Abdin M. A. Salih (Sudan)

Subject B

Significance of command area development in optimising benefits from irrigation. Application of new irrigation techniques and scheduling methods (soil water accounting procedure, etc.) in the command area and its impact on the conjunctive use of surface and ground waters. Use of different kinds of energy in the command area.

- 1 Water Management in Irrigation Systems-K. K. Framji and B. C. Garg (India)
- 2 Significance of Command Area Development in Optimising Benefits from Irrigation N. Kathpalia (India)
- 3 Irrigation Scheduling Based on Prompt Soil Moisture Control-Dr., Prof. V. A. Emelyanov, U. A. Babenko and L. I. Beskin (USSR)
- 4 Irrigation Design and Land Layout Techniques for Efficient Surface Irrigation, Collection and Utilization of Water from Multiple Sources-Joseph T. Rumble (Australia)
- 5 Quantitative Evaluation of Command Area of Different Well Sources-H. S. Chauhan, Raj Vir Singh, Avdhesh Chandra and K. S. Ghatode (India)

- 6 Field Studies on Sprinkler Irrigation-D. K. Datta, Y. P. Rao and S. C. Agarwal (India)
- 7 Indigenous Drip Emitter-R. K. Yadav and A. M. Michael (India)
- 8 Multiplot Multipulse Response Model-A Runoff Estimator-Prabhat K. Chowdhury (India)
- 9 A Series and Parallel Plot Runoff Model for Agricultural Watersheds-Prabhat K. Chowdhury, Vijay P. Singh and Jaswant Singh (India)
- 10 Design Criteria for Predicting Rate of Advance in Border Method- H. B. Battawar (India)
- 11 Optimising Irrigation Water Requirements for Increased Water and Fertilizer Use Efficiency of Crops Using Nuclear and Allied Techniques-R. P. Arora, Y. K. Sud, M. S. Sachdev and B. V. Subbiah (India)
- 12 Analysis of Clinical Characteristics-A Suggested Approach for Water Management System Design-B. Naik (India)

Subject C

Cropping patterns to suit soil and climatic conditions as well as availability of surface and ground waters. Systems approach to selection of crop-water application in optimising benefits under limited water availability.

- 1 Application of Linear Programming for Crop Benefit Optimisation-A Case Study of Bhadar Irrigation Project, Gujarat, India-M. N. Venkatesan and T.N. Ramalingam (India)
- 2 Determinants of Cropping Patterns in Command Area of an Irrigation Project: An Empirical Investigation of Mahi-Kadana Irrigation, Gujarat, India-T. K. Jayaraman (India)
- 3 A model of Cropping Pattern for the Conjunctive Use of Underground Saline and Canal Waters-J. Nath, S. Dev, A. Singh and M. Raj (India)
- 4 Effect of Interaction of Irrigation and Labour on Optimal Cropping Pattern-Ranvir Kumar and Joginder Singh (India)
- 5 Cropping Patterns and the Environmental Factors in the Kano River Project of Nigeria-E. U. Nwe (Nigeria)
- 6 Study on Efficient Utilization of Available Water Resources by Growing Combination of Rabi Crops-M.R. Bajpai, G. D. Singh and S.L. Sharma (India)
- 7 Summer Bajra (*Pennisetum Typhoides* (Burm.) S. and H.)-A New Promising Introduction for Heavy Black Soils Under Ukai-Kakrapar Command Areas in Gujarat-R.S. Joshi, N.C. Desai and S. D. Patel (India)
- 8 Social and National Benefit by Judicious Use of Irrigation Water in Wheat Crop under Different Agroclimatic Conditions of Gujarat-R.S. Joshi, H.V. Amin and I. R. Patel (India)
- 9 Water Management of Rice in Relation to Ground Water-Table-S.C. Panda (India)
- 10 Water Requirement, Water Management, Evapotranspiration in Rice and Ayacu Planning-D. Lenka (India)

- 11 Rational Use of Irrigation Water in Crop Production-Dr. Suraj Bhan (India)
- 12 A Crop Irrigation Simulation Model-Ranvir Kumar, Joginder Singh and Rajinder Singh (India)
- 13 Effect of Time of Sowing and Irrigation on Growth, Yield and Water Use Efficiency of Lentil (*Lens Esculenta* Monech)-D.S. Singh, Phool Singh, Pratap Singh and Maharaj Singh (India)
- 14 Water Use-Yield Relationship as Influenced by Crop, Soil and Climate-T.N. Chaudary and R. K. Gupta (India)
- 15 Functional Relationship Between Salinity of Irrigation Water, Depth of Water Applied and Crop Yield -M.P. Kaushal and S. P. Khepar (India)
- 16 Water Management Cauvery Delta-S. J. Ambrose, S. Muthukumaraswamy and Dr. K. Palanichamy (India)
- 17 Integration of Irrigation Systems in 1980's-A.C. Chaturvedi (India)
- 18 Water Management in Eastern Ganga Canal System-Jagdish Mohan (India)

Subject D

Assessment of ground water recharge in quantity and quality from irrigated areas for different types of soils, crops and irrigation for both lined and unlined canals.

- 1 Assessment of Ground Water Recharge in Irrigated Areas of India-Present Studies and Scope of Further Research-R.S. Saksena (India)
- 2 Case Studies on Recharging Ground Water in Coimbatore District-Dr. D. Chandrasekaran and Prof. R. K. Sivanappan (India)
- 3 Evaluation of Ground Water Recharge on Irrigation Systems of the Arid Zone-Yu. A. Babenko, Yu. G. Golovchenk and A. F. Puzanov (USSR)
- 4 Ground Water Resources of Lower Bhavani Canal Command Area in Noyil Basin-K.C.B. Raju, P. Subramanian, Sanjay Mukharia and K.P. Banerjee (India)
- 5 Role of Percolation Tanks (Mini Storages) in the Management of Underground Water Resources-V. Ranganatha Rao (India)
- 6 Return Flow and its Formation with Regard to Irrigation Development and Irrigation Systems Improvement V. A. Dukhovny (USSR)

Subject E

Operational programme of projects-need for monitoring the performance of the project. Transfer of technology-Role played by extension and demonstration services.

- 1 Water Management Technology Transfer to Farmers-R.A. Rastogi and Vinod Kumar (India)
- 2 Organisational and Management Problems in Major Irrigation Systems-A Case of Lower Bhavani Project, Tamil Nadu, India-K. Palanisami and R. K. Sivanappan (India)
- 3 Les Inundations Dans La Plaine Du Gharb-M. Bouhamidi Mustapha (Rabat)
- 4 Maitrise Des Eaux Dans Le Perimetre Du Tafilalet-Zerhouni Abdel-Jalil (Maroc)

綜觀以上58篇論文中，有政策性及工程報導，個案研究成果報告，水資源科技介紹等，而以印度提出最多，共39篇，約佔三分之二。會後有六天之參觀旅行，參觀一處至兩處印度之水資源研究計劃，以及印度之名勝古跡。參觀旅行原預定四組，但其中兩組因報名人數少而取消，只剩兩組，且有名額限制。

三、我國派員參加亞非地區第三屆會議經過

我國為國際灌溉排水協會亞非地區之會員國，本次會議籌備期間，我國家委員會於1979年11月及12月分別接獲印度國家委員會與ICID協會總部秘書處函請提供論文及派員參加之邀請函。即由我國家委員會分函各有關水利單位查照。行政院農業發展委員會即決定派筆者參加會議並提送論文一篇預定在會中宣讀討論，論文題目為：“Optimization of water resources utilization for regional agricultural planning in the Minteh Reservoir irrigation area in Taiwan”(明德水庫灌區農業資源規劃配合水資源最佳利用之探討)，另外外交部亦函經濟部組團參加。

筆者於69年7月接到我國家委員會轉送之報名表，隨即郵寄報名，並辦理赴印簽證手續。由於印度與我無邦交，且以往對我極不友善，國人以「參加開會」名義很難取得入印簽證。筆者在重重困難

之情形下，並經我外交部國際組織司之協助，共歷經55天，始於69年10月25日下午在香港啓德機場印度航空公司櫃檯取得赴印之觀光簽證書，於10月26日清晨抵達印度新德里，但會期已過四天(23日開始)，只剩兩天會期及一週之旅行參觀。由於筆者到達較遲，旅行參觀名額已滿，無法參加，只有參加兩天會期及收集有關印度之水資源研究開發及利用資料，回國供國內水利界參閱。

本次會議我國代表除筆者外，另經濟部派水資會主任委員須洪熙為首席代表，須主任委員因辦赴印簽證較遲，致未能成行。本次會議主辦單位，印度國家委員會，在其外交部之壓力下，本不同意我方代表參加會議(本預期我方無法赴會)，經我方代表向ICID總部交涉及抗議，主辦單位ICID總部在壓力下，始同意我方代表參加，但筆者所提送之論文却未被排在會議中宣讀及討論，至感遺憾。

四、感想與心得

1. 此次ICID第三屆亞非地區會議，純粹為一技術性會議，完全沒有政治色彩，而印度主辦單位受其外交部之壓力，雖曾一度拒絕我方代表與會，但最後乃讓步同意我方代表參加，亦即把政治帶入會場，實為一大憾事。

2. 印度號稱次大陸，地大人眾，茲就印度與臺灣之水土資源比較如下：

項 目	印 度	臺 灣	備 註
總 面 積 (km ²)	3,149,957	95,990	
人 口 (人)	600,000,000	17,675,000	據非正式估計為 650,000,000 人
人 口 密 度 (人/km ²)	191	491	
耕 地 (ha)	167,000,000	918,000	據調查全印度可耕地為185,000,000公頃
土 地 墾 殖 率 (%)	53.00	25.51	
灌 溉 地 (ha)	113,000,000	517,000	
灌溉地佔耕地面積 (%)	68.0	56.0	
年 平 均 雨 量 (mm)	1,170	2,430	世界平均為 973mm
年 總 降 水 量 (億 m ³)	36,855	874	
每人每年水資源賦與量 (m ³ /人/年)	6,140	4,950	世界平均為 33,975 m ³ /人/年。

由上表可知，印度之天然水土資源條件雖均較佳，且其對水土資源之開發與利用亦有相當之成果，但其國內水災及饑荒時有所聞，反觀，我國臺灣

地區之水土資源雖有限，但國內却人人溫飽，此為國內農業科技推展之成果，是國內從事農業工作人員引以為慰之事。

3. 印度以農立國，為確保農業生產，故灌溉事業興盛，加以較充沛之雨量以及平坦之地形，故對水患之防治，亦極需要，因此對水資源之控制，開發與利用起步得很早，且很重視研究工作，迄至1979年全部共有16個水利工程研究機構，加上大學研究院系，全國共有30個水資源事業研究機關，該些研究單位除對印度水資源事業開發積極參與工作外，對世界水利事業亦頗多貢獻。如許多水力學之

有名公式，源淵自印度。

4. 由於 ICID 總部秘書處設印度新德里，因此之故，世界各地之治水及利水方法，印度水利工程單位很易獲得，作為參考。如臺灣之北港溪與烏溪之堤防設計断面資料，編列在印度之「河工手冊」中，且與大陸幾條河流之堤防断面並列在一起，供比較參考（如下圖）。

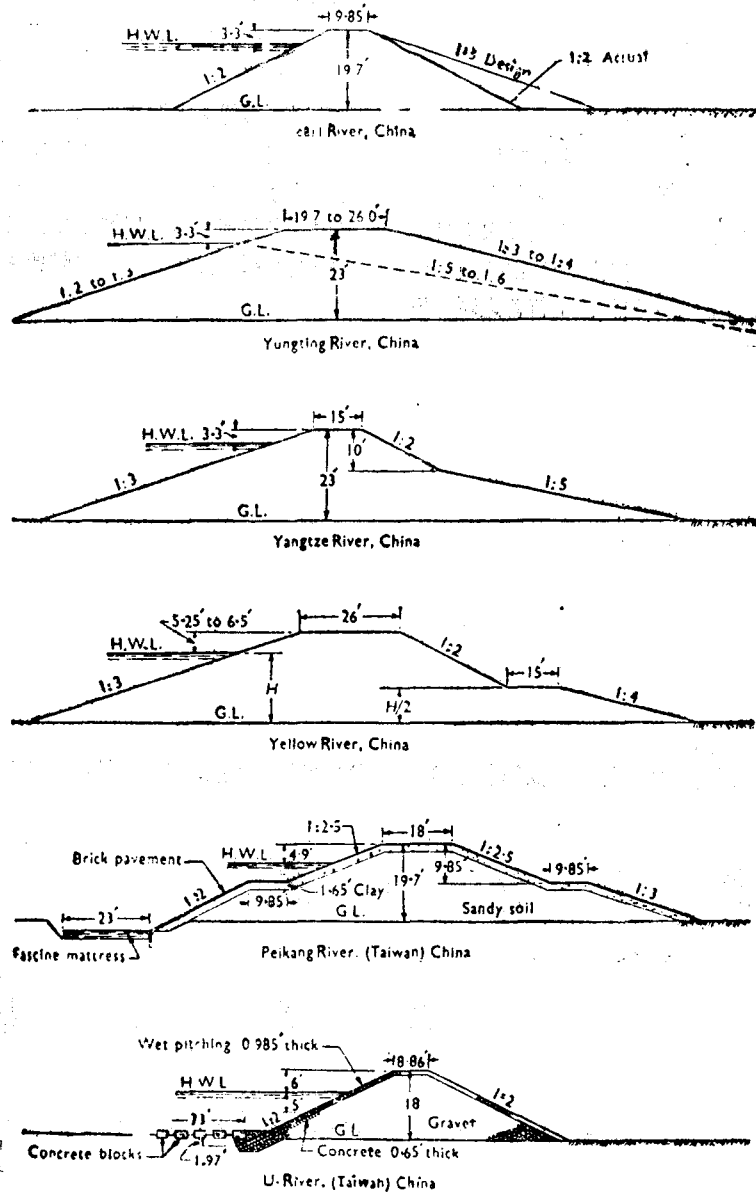


FIGURE VII 28: Showing type designs of embankments.

我國與印度無邦交，且以往水利科技之交流幾乎沒有，只有藉參加國際水利會議在印度召開之便，設法獲得印度水利單位編印出版之水利科技資料。筆者此次參加會議，除獲兩冊此次會議之論文集外並購得下列兩冊水利刊物帶回國內供研究。故今後在印度召開之國際性水利會議，我國水利工程單位宜盡量設法參加，此類會議在印度召開得很多。

1. Manual on River Behavior, Control and Training, Central Board of Irrigation and Power, New Delhi, India.

2. Water Resources Research in India, Central Board of irrigation and Power, New Delhi, India.

5. 印度政府刻意在提高其國內之高級科技，故對科技研究單位之建築物均美侖美奐，對人才之延攬特別禮遇，經費籌措寬裕，而對廣大民衆之日常生活，似乎照顧得不多。印度人民除貧富差距大外，生活水準之差距亦很大，如新德里首善之區，搭

帳篷或在舊破車內，甚至在寬濶街道之人行道上席地而安之露天生活民衆甚多，與臺灣相比，寶島實是一天堂。

6. 印度除貧富懸殊外，政府對廣大民衆業餘之消遣，似未有妥善之安排。如筆者在印期間，未曾發現有電視之住家，街上亦未發現有賣電視之商店，其對全民體育及民衆正當娛樂之提倡似亦不積極，因此在街上遊蕩之印人甚多，但印人本性溫和，廣大羣衆在此社會環境下，甚少發生偷竊搶劫及暴動等情事。

7. 本次會議閉幕式中，非洲奈及利亞代表發言，ICID 第四屆亞非地區會議，將於1982年六月在奈及利亞舉行，歡迎亞非地區會員國派代表參加並提供論文。該會議之研討專題為“River basin development for crops production”。希望國內水利專家能及早準備提供論文參加，期提高我國之水利科技在國際上之聲譽。

歡迎會員先生

多多投稿