



Irrigation Newsletter

A Quarterly Publication from Nepal on Irrigation

No 77

www.doi.gov.np

Mid-November 2008 - Mid-March 2009

NEWS UPDATE

IWRMP Inauguration and Approval of Sub-projects

Irrigation and Water Resources Project (IWRMP) was formally inaugurated by the honorable Minister of Water Resources, Mr. Bishnu P. Paudel on December 18, 2008. On the occasion, Director General of Department of Irrigation (DoI), Mr. Madhu Sudan Poudel gave the welcome address and the Project Director of IWRMP, Mr. Purushottom Shahi gave a brief introduction to the program. Similarly, Mr. Kishor Thapa, Acting Secretary of Water and Energy Commission Secretary (WECS) also expressed his opinion about the project.

Speaking on the occasion, Minister Paudel explained that the project will be successful if the enthusiasm during the inauguration can be maintained until the end of the project and beyond. He also thanked the donors for the grant assistance for the project. On the occasion, the representative from World Bank Office, Mr. Bigyan Bahadur Pradhan, also expressed his opinion. The inauguration function was chaired by the Secretary of Water Resources, Shankar Prasad Koirala. He also thanked the donors and expressed his commitment to carry out anything necessary from his side for the success of the project and also instructed all the DoI staff to do the same.

Similarly, the first meeting of Project Implementation and Coordination Committee (PICC) chaired by DG of DoI was held on March 10, 2009. The PICC approved 6 sub-projects from Mid-western region for implementation.

First Field Piloting of NWP 2005

WECS in conjunction with World Wildlife Fund (WWF) on February 25, 2009 announced the initiation of the first field implementation of National Water Plan (NWP) 2005 with the official inauguration of Koshi River Basin Management (KRBM) programme.

The Koshi River Basin, a trans-boundary river basin starting from Tibet and Nepal, was selected by the government to pilot the integrated approach of basin management as prioritized by the NWP. The vision of KRBM is to make optimum use of Koshi basin's water and related resources to promote socio-economic development for the benefit of people in the basin while maintaining the ecological balance. The pilot field activities were initiated in the Dudh Koshi sub-basin, one of the seven sub basins of Koshi River Basin in Nepal.

Supported by the government and the WWF, the Dudh Koshi Sub Basin Project office at Salleri will work with the local communities through Integrated Resource Management Committees (IRMC), which will be formed and institutionalized with the support from the project. The IRMCs are the catchment level management bodies under the river basin management governance structure recommended by the NWP.

On the occasion, Mr. Kishor Thapa, Acting Secretary at WECS, explained that the government is serious towards harnessing the concept of integrated water resources development through wider consultations with various bilateral and multilateral donor communities and other related stakeholders.

Fourth JCWR Meeting

The fourth meeting of the Joint Committee on Water Resources (JCWR) between Nepal and India took place in New Delhi from 12 to 14 March. The Nepali team was lead by Mr. Shankar Prasad Koirala, Secretary for Water Resources.

The meeting discussed on the reconstruction of the Koshi Embankment damaged in September last year, maintenance of the Gandak barrage and the inundation of Nepali

and Indian land due to embankments constructed in India, and the finalisation of ToR of the Pancheshwar Development Board as per the Mahakali Integrated Treaty and the Naumure hydel project to be constructed through Indian assistance. The Nepali side requested India to expedite construction of transmission lines damaged by Koshi floods and the cross border lines so that the quantity of power imported from India could be increased.

The meeting concluded signing a 34-point agreement. While the Terms of Reference (TOR) for Joint Ministerial Commission has been finalised, TOR on Pancheshwar Development Authority could not be finalized and will be discussed in the next meeting to be held in September 2009 in Pokhara, Nepal. The meeting also agreed to form a Joint Committee on Inundation and Flood Management to review inundation issues in Nepal-India border and solve such problems.

Highlights of the Issue

News Update

- IWRMP Inauguration and Approval of Sub-projects
- First Field Piloting of NWP 2005
- Fourth JCWR Meeting
- DoI Administrative Update
- Appointment of ED in GWRDB
- General Assembly of NFIWUAN
- IWMI DG's Visit to Nepal

Editorial

- Climate Change, Water Scarcity and the Way Ahead for Agriculture

Training/Workshop/Seminar

- On-the-job Training for DoI Engineers
- Training on DTM and AutoCAD
- Public Procurement Management Training
- ICWMP Technical Staff Training
- WUA Training in Babai, Rajapur and Kamala Irrigation Systems
- Training Program for Participants from Nagaland and Sikkim
- International Conference on Water Resources Policy in South Asia

Feature Articles

- Experiences of Traditional Irrigation in Balkh Province, North Afghanistan- Robert Wilkens and Lok Bahadur KC
- Degrading Agriculture in Canal Command: An Indian Experience – Dr. Ashok K. Raut

Forthcoming Events



Editorial

Climate Change, Water Scarcity and the Way Ahead for Agriculture

Recent studies have shown that climate change is likely to have more dramatic effects on global agriculture than previously predicted. A recently completed research that calculated the difference between historical and projected average temperatures each season throughout the world has revealed that harvests of maize, rice and other staple crops could drop by up to 40 % by the end of the century because of higher temperatures during the growing season. Using data from 23 global climate models the study predicts that for every rise in seasonal temperature of one degree Celsius, yields of major grain crops will drop by 2.5–16 %. The study stresses on the projected increases in temperature in addition to the more common emphasis on drought.

The impacts of climate change in the form of higher temperatures and more extreme weather events is expected to have significant impacts, particularly in South Asia, which is already very vulnerable on account of its high levels of population density and poverty. About 70 percent of South Asians live in rural areas and account for about 75 percent of the poor. Most of the rural poor depend on agriculture for their livelihoods. With their economies closely tied to climate sensitive sectors like agriculture, the poor are likely to be disproportionately affected by climate change.

IWMI's recently concluded study reveals that up to twice as much water as is consumed now will soon be needed to support the world's growing population. On top of that, due to climate change, increases in temperature combined with predicted changes in precipitation will result in higher variability. Thus water availability is under threat both from growing demands and variability in supplies.

Urgent action is felt needed to address this issue both in terms of investment in the infrastructure and development of knowledge and strategies and their effective implementation.

One of the options can be the use of Evapotranspiration (ET) technology. This is the approach that was promoted by the World Bank and recommended for China when it faced severe drought during the month of January, 2009. The technique uses data from satellite images to calculate the level of water lost by ET from a farmer's land. It, thus, distinguishes between water permanently taken out of the system through evaporation and transpiration and water returned to the system, and the water users are asked to pay only for the amount of water that is actually used. Through this procedure, it is hoped that farmers will be encouraged to take steps to reduce the evaporation and transpiration losses that does not contribute to plant growth. They can do so by using species that require less water, reducing waterlogged areas, irrigating at times when evaporation is lowest (e.g. at night), using a covering of straw or plastic sheeting around plants to prevent excessive evaporation, and replacing open canals and ditches with pipes. They might also reduce plant transpiration by using varieties tolerant to water stress and by weeding. Where excessive fertilizer and pesticide runoff is a problem, farmers will also be encouraged to reduce pollution.

Chief Editor

Suman Sijapati

Editors

Manik Lal Kalu Shrestha
Naba Raj Shrestha
Tanka Prasad Kafle
Pradeep Kumar Manandhar
Hari Prasad Dulal
Dev Raj Niraula
Gauri Lal Upadhyay

Editorial Advisor

Damodar Bhattra

Computer

Padma Shree Bajracharya

Dol Administrative Update

A total of 181 transfers were made through the decisions of Government of Nepal and the Departments of Irrigation during January to March 2009. Out of this were 22 senior engineers, 45 engineers and supporting staff.

Major decisions among these were the appointment of Mr. Mahendra Bahadur Gurung as the DG and Mr. Shanti Kumar Hyoju and Mr. Hiranand Jha as DDGs of the Department of Water Induced Disaster Prevention, transfer of Mr. Khom Raj Dahal and Mr. Pradeep Raj Pandey as the Regional Director of Central and Western Regional Irrigation Directorate respectively, transfer of Mr. Prakash Poudel to Commission of Investigation of Abuse of Authority, promotion of Mr. Servadev Jeswal to Gazetted First Class and appointment as the Project Manager of Sikta Irrigation Project and replacement of Mr. Janak Dahal by Mr. Babu Ram Adhikari as the Chief Administrative Officer of Dol.



Appointment of ED in GWRDB

As per the decision made by Government of Nepal (GON) on Feb 13, 2009 Mr. Jeeban Lal Shrestha has been appointed as the Executive Director (ED) of Groundwater Resources Development Board (GWRDB). This decision follows the third amendment of the GWRDB Formation Order which was made effective by GON on Feb 10, 2009. The third amendment has not only selected more relevant as persons as committee members but also refined the functions and responsibilities of the Board.

NFIWUAN General Assembly and Workshop

Third General Assembly of the National Federation of Irrigation Water User's Association Nepal (NFIWUAN) was held on March 2 to 4, 2009. Minister of Water Resources Mr. Bishnu Paudel was the chief guest in the GA program organized in Biratnagar. 345 representatives from 2500 Water Users' Associations from 73 districts were participated in the GA. It concluded nominating a new executive body: Mr. Ram Prasad Mehata as President, Gajadhar Yadhav as Vice-president, Ram Lakhan Harijan as General Secretary, Shambu Dulal as Secretary and Indu Gurung as Treasurer. Similarly, central level members were selected one representative from each zone (total 14) and 5 male and 5 female, one to represent each development region.

Prior to this a one-day workshop on Irrigation Act and Irrigation Service Fees was also conducted through the support of Dol on March 1, 2009. The workshop was chaired by the then Secretary of NFIWUAN, Ms. Indu Gurung and the President of NFIWUAN, Mr. Ram Prasad Mehata was the chief guest. Mr. Uttam Raj Timilsina (DDG, Dol); Mr. Binaya Kumar Singh (Project Manager, Sunsari Morang

Irrigation Project); Mr. Rabi Babu Shrestha (SDE, ERID); and Gauri Lal Upadhaya (Sociologist, DoI) also participated in the workshop.

Mr. G. L. Upadhaya presented a paper on the proposed Irrigation Act and comments and suggestions were received from the participating NIFWUAN members. The workshop concluded that the proposed Irrigation Act needs to be refined considering the environmental aspects and the welfare of the irrigation water users and then should be forwarded to the government for approval and execution.



IWMI DG's Visit to Nepal

Dr. Colin J. Charters, Director General, International Water Management Institute (IWMI) was on an official visit to Nepal from 7 January 9, 2009. During the visit he was briefed on IWMI-Nepal activities at IWMI Nepal office. He paid courtesy call to Secretary, Ministry of Water Resources and DG, DoI. In both the meetings, Dr. Charters briefed on IWMI's Strategic Plan (2009-2013) and some of the on-going IWMI research activities in other parts of the world which may be of relevance to the Nepalese context. Likewise, research needs of Nepal were discussed in which the priority area identified was on increasing irrigation efficiency and IWMI's research support sought in this area. Also, implication of climate change on water availability was identified as priority area in water management research. It was discussed that IWMI will work on developing proposal on research area of Nepal's need and it requested for government support in accessing funding from donors.

TRAINING/WORKSHOPS/SEMINARS

On-the-job Training for DoI Engineers

A Professional Development On-the-job Training was conducted for the newly promoted Engineers of DoI from the November 10th to 24th by System Management and Training Program. The training program was conducted at Department of Irrigation, Jawalakhel and 36 engineers participated in it. The objective of the program was to enhance the technical capability of the engineers and refresh them about the current activities of the department. Various subjects on technical know-how and design, working modality of the central level irrigation projects, administrative and financial management and as well as irrigation development vision and plans were covered. The participants showed keen interest and requested such training programs be conducted on regular basis and with more emphasis on technical design aspects.

ICWMP Technical Staff Training

A three day Technical Staff Training (TST) Workshop was conducted for the members of the District Technical Team (DTT) working in the districts in which Integrated Crop and Water Management Program (ICWMP) program is currently being executed in the Eastern and Central Development Regions. The program was held from November 18 to 20, 2009 in Bharatpur. Altogether 43 participants from DoI and DoA participated in the training.

Training on DTM and AutoCAD

Capacity building training about the software on Digital Terrain Modeling (DTM) and its Application for Canal Design was organized by Institutional Development Support Centre (IDSC) for eight engineers of DoI from January 13-23, 2009. Thus, so far total of 40 engineers in DoI have been trained about this software.

Similarly, AutoCAD training was conducted from January 22 to February 12, 2009 for the engineers of DoI in which 12 participants learned the skill.

Public Procurement Management Training

Resource persons from Management Association of Nepal (MAN) conducted a training on Public Procurement Management for the staff of DoI. The training was organized by IDSC of DoI and was conducted from March 1 to 13, 2009. Total 25 senior staff participated in the training.



WUA Training in Babai, Rajapur and Kamala Irrigation Systems

Field level trainings were conducted for the Water User Association members and farmers of Babai, Rajapur and Kamala irrigation systems. The training topic in Kamala was 'Office Management' and was conducted from Jan 18-20, 2009. While in Babai and Rajapur irrigation systems the training topic was Irrigation Service Fees (ISF) and was conducted from February 8-10 and Feb 13-15 respectively.

MUS Training Program for Participants from Nagaland and Sikkim

A training program was organized at Aloha Inn, Jawalakhel, Lalipur from 3-5 March, 2009 jointly by IWMI, NAIP and IDE/Nepal for the participants from Nagaland and Sikkim on Multiple Water Use System (MUS). There were 7 participants from Nagaland, India lead by Dr. B.P. Bhatta and 6 participants from Sikkim, India lead by Dr. A. Rehman. The training program was inaugurated by Mr. Madhusudan Poudel, DG, Department of Irrigation. The program focus was to train the

participants from Nagaland and Sikkim about the Multiple Water Use System/Services. Technical design and construction details, types and methods of micro irrigation, its end use, benefits, its Socio-economic and institutional aspects and policy environments in Nepal was covered on 4 March 2009. It was followed by the field visit, interaction with farmers about micro-irrigation and MUS technology on March 5, 2009 in Salyan village, Lalitpur. Then the feedback/impression from the field observation and the future plan of the participants was discussed on the same day with closing session and the certificate distribution to the participants by Mr. Uttam Raj Timilsina, DDG, DoL.

International Conference on Water Resources Policy in South Asia

The International Conference on Water Resources Policy in South Asia was held in Colombo from December 17-20 at the Taj Samudra. The conference inauguration took off with a grand opening in the presence of 150 guests including special invitees from Sri Lanka. The programme began with a short speech from the Convener who laid out the objectives of the Crossing Boundaries Project at SaciWATERS and the importance of the conference in trying to bring people from all walks of life together on a common platform to hear about their views on various issues related to the water resources in South Asia and its policy implications. Prof. Jayanta Bandyopadhyay, President of SaciWATERS Hyderabad Board welcomed all the participants and the keynote speakers, Dr. Amita Baviskar, Dr. Madar Samad to the conference. He also provided the regional relevance of the conference to the participants. Dr. Amita Baviskar spoke about 'putting cultural politics into Water Policy' while Dr. Samad spoke in the context of "Building a Resilient Water Economy in South Asia through Better Agricultural Water Management". Prof. Munasinghe, another keynote speaker was unable to attend the conference but had sent his recorded speech - Sustainable water resource development and climate change - an integrated policy framework. This was followed by a brief outline of the e-journal South Asian Water Studies (SAWAS) and a detailed explanation of the features of the website by Prof. Vishwa Ballabh. He highlighted the importance of the website in disseminating knowledge and information about the water sector to the larger masses and urged all water professionals to actively participate and contribute to this endeavor. This website was inaugurated by Dr. Baviskar shortly afterwards. Right after this event a book entitled "Droughts and IWRM in South Asia" was released by Dr. Samad. This was followed by a cultural programme and dinner.

The next three days of the conference were characterized by about 80 presentations by persons in various capacities from universities, research institutes and civil society organisations. The second day had two special sessions, one where world experiences were presented by three women water professionals working in Chile, South Africa and European Union. Another session brought bureaucrats from Sri Lanka, Nepal, Bhutan and Pakistan on a common platform for a panel discussion after which the discussion was open to the floor for further interaction. The third day was characterized by 4 parallel sessions, where a wide range of issues were presented and discussed.

The last day of the conference was featured by a special discussion on Water Education Policy in South Asia, where studies conducted in the partner institutes and those conducted at the regional level were presented. The purpose of the session was to realize the status of water education in South Asian institutes. It also opened discussion and sought feedback from all participants on education policy and steps forward to achieve an IWRM paradigm. The last session was

conference plenary which summed up all the sessions in a nutshell and finally concluded with a vote of thanks by Dr. Dibya Ratna Kansakar, Executive Director, SaciWATERS. He also announced the winner of the Best Young Researcher Paper, the prize for which was handed over by Peter Mollinga to Ms. Sonia Binte Murshed of Bangladesh.

FEATURE ARTICLES

Experiences of Traditional Irrigation in Balkh Province, North Afghanistan

✎ Robert Wilkens and Lok Bahadur KC

Afghanistan is a land-locked and thinly populated country with rugged terrain, abundant deserts including dry and barren land. The total surface area of the country is 652,090 km² of which, 58.35 % is agriculture land and 2.1% forest cover. However, only 12.13% or 8,054,000 hectares of the land is arable with permanent cropland. Furthermore, irrigated land comprises only 33.8 % of the total crop land. On the whole, the country has a subsistence agriculture based economy with most of the rural population depending on agriculture. The country has been persistently plunged in turmoil, social unrest and war. Political stability remains as a topmost pertinent issue to be resolved despite abundant foreign aid and assistance.

The monsoon rain rarely reaches this country and rainfall is mostly from the Mediterranean winds. An average of 313 mm annual rainfall, mainly during March, April and May and snow in January and February recharges the groundwater and produces overland flow. Traditional surface and groundwater irrigation systems built mainly by farmers supply water for agriculture and domestic purposes. The *kyrez* or traditional sub-surface irrigation galleries are very famous in Afghanistan.

The Balkh River flows across the Balkh and Jawzjan Provinces of northern Afghanistan. Its water is entirely utilized by 23 farmer-managed canals branching off from the river in the 'Hazda Nahr' area over a distance of 122 km. There are 11 canals in the lower Hazda Nahr system encompassing an irrigable land area of 432,000 ha as shown in the table below. Scarcity, poor equitable distribution, conveyance losses, and improper management are some of the prime issues that need immediate attention.

The Emergency Irrigation Rehabilitation and Reconstruction Project Traditional Irrigation Component (EIRRP-TIC), initiated in 2004 with an aim to improve efficiency and water management, allows flood discharges of 3 times the dominant canal flow that occurs when the Balkh River discharges 50 m³/s closely upstream of the first intake of the Imam Sahib Canal.

Water is abstracted from the river by free intakes: no weir may be put across the river to raise the water level during the dry season. A portion of the water is taken out by extending an intake levee (*miyanji*) at the side or slightly across. As no temporary weirs could control the water level and, given the fact that the river gradually cuts itself in a deeper channel, the intakes had to be moved upstream from time to time.

Sediment deposition in the canal is the predominant problem of the region. Each year, farmers organize a campaign to desilt the upper reach of the canal after the flood season. All water using villages provide free labor (*ashar*). Large spoil depositions along the canal have become very high over the centuries, particularly along the

Balkh Canal where some of them are as high as 10 m, requiring considerable effort to lift the sediment up with buckets and spades.

Canals were extended or new canals constructed in locations where new communities settled. Proportional division structures were constructed with the help of the government or entirely by the communities. Many parallel running canals have been constructed as existing communities could not agree with new coming tribes on a joint water management from one canal. Desilting requires space for spoil hills. When three or more canals are placed beside each other, the limited space available for sediment deposition becomes a problem.

Design Discharges of Dominant and Permissible Flood Flow of the Project EIRRP-TC

Canal System	Area (Paikal)	Water Allocation (%)	Dominant Discharge at 51.0 m ³ /s in Balkh River			Permissible Flood Discharge at 150 m ³ /s in Balkh River		
			m ³ /sec	lit/s/Pk	lit/s/ha	m ³ /sec	lit/s/Pk	lit/s/ha
1. Imam Sahib	200	3.8%	1.9	9.7	0.12	3.9	19.4	0.24
2. Nahre Shahi	560	10.7%	5.4	9.7	0.13	10.0	17.9	0.25
3. Siah Gerd	150	2.9%	1.5	9.7	0.12	2.9	19.4	0.24
4. Balkh	70	1.3%	0.7	9.7	0.12	1.4	19.4	0.24
5. Mushtaq	209	4.0%	2.0	9.7	0.12	4.1	19.4	0.24
6. Chintal	164	3.1%	1.6	9.7	0.12	3.2	19.4	0.24
7. Abdullah	700	13.3%	6.8	9.7	0.13	13.6	19.4	0.27
8. Daulat Abad	750	14.3%	7.3	9.7	0.12	14.6	19.4	0.24
9. Char Bolak	750	14.3%	7.3	9.7	0.12	14.6	19.4	0.24
10. Faiz Abad	600	11.4%	5.8	9.7	0.12	11.7	19.4	0.24
11. Aqcha	1,100	20.9%	10.7	9.7	0.10	70.2	63.8	0.64
Total	5,253	100.0%	51.0			150.0		

Note: Conversion from Paikal to Hectare is based on the ratio as shown in the Project of Water Resource Management and Planning (ADB, TA 3874- AFG Component 1B).

- 80 ha/Paikal: Emam, Siah Gerd, Balkh, Mushtaq, Chintal, Daulat Abad, Char Bolak, Faiz Abad Canal.
- 72 ha/Paikal: Nahre Shahi, Abdullah Canal.
- 100 ha/Paikal: Aqcha Canal.

Usually, farmers do not construct canals in straight lines. They seem to have the notion that water flows slower in winding canals and the consequent higher water levels will infiltrate more water into the soil. Another local perception is that winding canals are less liable to siltation than straight canals.

As canals were entirely maintained by the communities, the main focus of the project was on construction rehabilitation such as proportional flow divisors and modified flow dividers, pipe outlets, bench flumes and other canal lining, discharge measurement structures such as Parshall flumes and Crump weirs in all proportional flow divisors, aqueducts, road culverts and bridges, rectangular and inclined drops, pipe drops, waste ways and side spillways, and headworks repair. There is an urgent need to increase the conveyance efficiency of the canals by lining, straightening of winding canals and by merging canals.

In spring, the groundwater reaches the soil surface at many places and a white crust of salt appears due to evaporation by the hard and dry winds. Canals leak water and salt accumulation continues over the years.

The traditional negotiation and determination of *paikal* land units does compensate for water loss due to long conveyance distances and where certain obstructions or domestic areas are passed. Farmers, however, prefer nowadays the calculation of *paikal* land units based on land tax data to better express the value of the water as it gets increasingly scarce due to the growing population. This should be a valuable argument to increase the conveyance efficiencies of the canals.

The hydraulic design of division structures is difficult when canals may not be given a uniform longitudinal bed slope and regular cross-section geometry. This complicates the calculation of back-up and

draw-down curves of the water surface when designing division structures.

The project faced numerous difficulties such as time over-run, modification and re-design, lack of farmer's cooperation, and many more technical, social, security and management issues. In farmer-managed irrigation systems, social issues are dominant and need to be resolved preferably with signed agreements. Eventually, the current peace process has been supported by addressing many long-lasting water conflicts. Rigid time and canal sub-project output targets by project planners and decision-makers have inevitably been compromised. Since 2004, the consultant PCIA required 3 time extensions beyond the initial 15 months. The consultancy ended in November 2008 at 70.4% of the civil works budget of the ADB loan realized in construction. It is hoped that the works will not be disturbed by a similar severe winter as experienced in early 2008 and that the Ministry of Energy and Water will successfully supervise the completion of the running civil works contracts in 2009 without encountering large social problems.

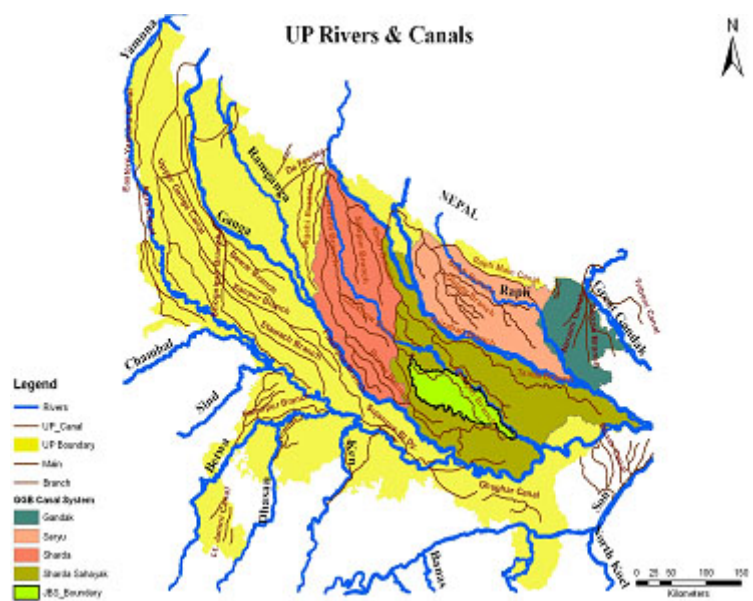
* Mr. Wilkens is an irrigation expert and Mr KC an irrigation engineer working in North Afghanistan.

Degrading Agriculture in Canal Command: An Indian Experience

Dr. Ashok K. Raut

Introduction

One of the most populous states of India, Uttar Pradesh, is endowed with the largest water resources in the country. A large network of perennial rivers contributes to its vast water resources potential and provides drainage to the state. Also, a deep alluvial aquifer underlies the vast plains, recharged annually by almost 1000 mm monsoon rainfall. Over the years, one of the world's largest irrigation systems has been developed in the state to support predominantly a rice-wheat crop cycle. Most of the canals are run-of-river systems supplemented occasionally by small reservoirs and were initially developed only for protective irrigation to mitigate the effect of long-term droughts and other short-term emergencies. However, in recent times, these irrigation systems have undergone several infrastructure improvements to cater to the increasing demand due to the introduction of high yielding crops.



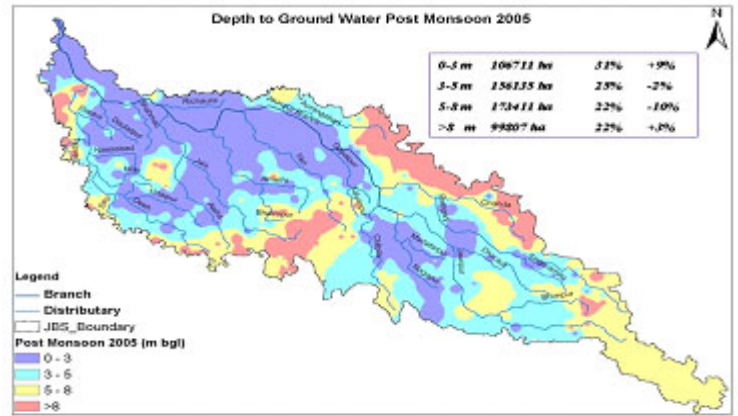
Under the current irrigation management practice, focus is given primarily to the delivery of canal water and use of groundwater is largely discouraged in canal command. Consequently, agriculture in the State is currently heading towards two extremes. On one hand the canal command, particularly in the head and middle reaches is being threatened by sustained water-logging and consequent soil salinity and sodicity while on the other hand tail reaches of canals, where canal supply is too little, irregular and unreliable, as well as non-command areas are exhibiting depleting groundwater levels. Both these conditions are significant threats to agriculture sustainability, intensity, productivity and diversity in the State.

The canal command areas have significant groundwater resources from canal seepage and recharge during high monsoon rainfall and have significant scope for development. However, current canal management practice precludes installation of tubewells in the canal command. Moreover, the cost of irrigation by tubewells is much higher compared to that of canal irrigation. All this is resulting in an environment not very favorable for conjunctive use. Recently, however, there has been a growing realization among irrigation professionals that water resources must be managed in an integrated manner creating an optimum balance among different sources of water i.e. rainfall, and canal and groundwater. Also, irrigation for agriculture can not be considered in isolation of other uses. Some initiatives have also been taken along those lines.

Under the current UP Water Sector Restructuring Project (UPWSRP) of the World Bank, initiatives have been taken to develop the basin plan based on integrated water resources management approach. As part of the program, basin plans are being developed for four major canal systems in the Ghaghra-Gomti Basin (GGB): Sarda, Sarda Sahayak, Saryu and Gandak with Jaunpur Branch Sub-Basin (JBS) as pilot study areas. This article mainly discusses outstanding issues and the available options for the 550000-ha JBS pilot study area between the Gomti and Sai Rivers. The entire study area is commanded by the Jaunpur Branch canal with 123-cumec design capacity under the Sarda Sahayak system. The soil is mainly dominated by fine clay loams with flat topographic features with limited scope for surface and sub-surface drainages.

Groundwater Levels

Under the UPWSRP program, the UP Irrigation Department recently installed about 500 piezometers with Automatic Digital Water Level Recorders (ADWLR) to monitor groundwater levels in JBS. Comparison of depth to groundwater maps of 2002 and 2005 clearly suggests that waterlogging exists predominantly in canal head and middle reaches where groundwater utilization is comparatively less and seepage from canals is higher.

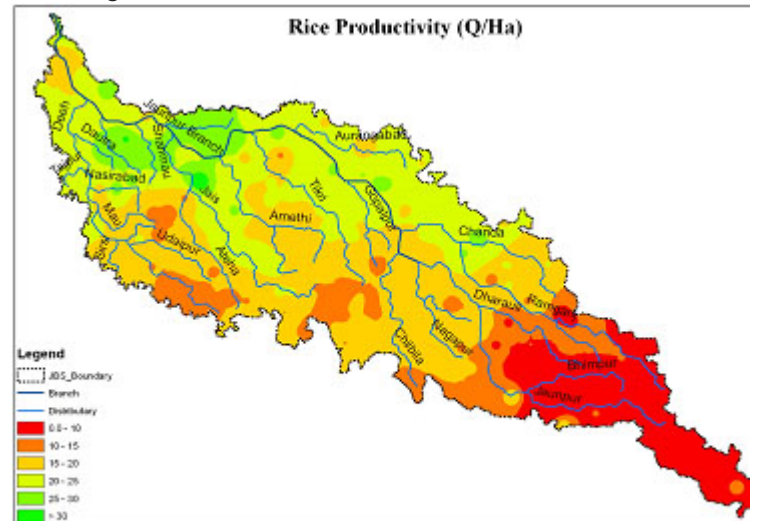


Groundwater Table in Jaunpur Branch Sub-Basin in October 2005

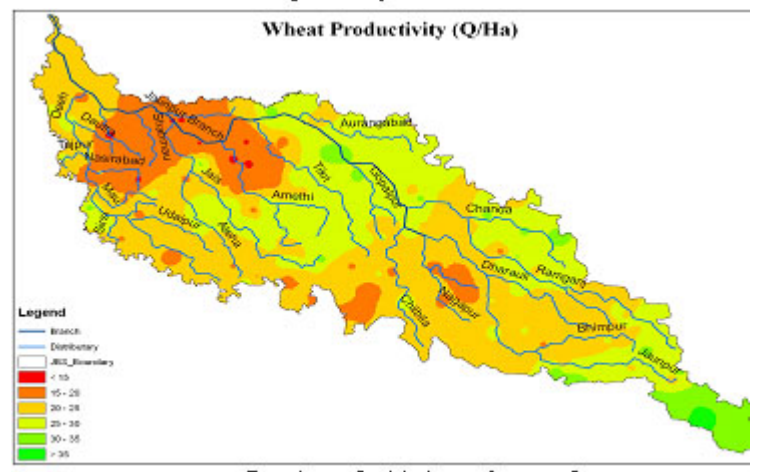
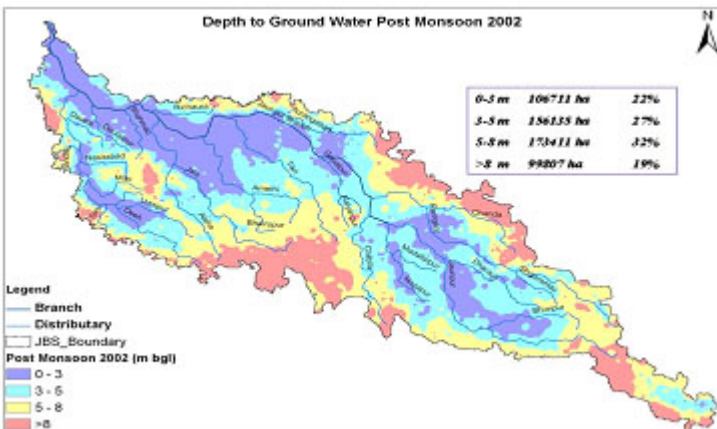
Groundwater utilization is more in canal tails and out of canal command where canal supply is either non-existent or very irregular, resulting in depleting groundwater levels. Distribution of canal supply appears to be lacking equitability with head and middle reaches using more than their shares. Higher groundwater levels in the canal command during the month of October causes considerable delay in land preparation for sowing wheat.

Crop Productivity and Diversity

Being less sensitive to waterlogging, rice exhibits higher productivity in the head and middle reaches of a canal where canal supply is adequate and reliable in the Kharif season. Quite expectedly, it shows lower productivity in the canal tails and out of command areas as canal irrigation is either not available or unreliable.



Poor rice productivity in canal command



Poor wheat productivity in canal command

Moreover, it is unaffordable to use groundwater for rice and, as a result, farmers usually avoid using it for rice. However, the average rice productivity in JBS is only 18 quintals/ha (Q/ha). This value is even less than the state and national averages of 19 Q/ha and 25_Q/ha respectively. Assuming other factors are similar all over JBS, the reason for low productivity is attributed more to persistent waterlogging in the canal head and middle reaches leading to degraded soil health, thereby aggravating the already degraded scenario of irrigated agriculture.

Similarly, the wheat scenario suggests that productivity is higher in the middle and tail reaches where waterlogging is less and groundwater is used more. In contrast, this is comparatively low in the head reaches in spite of higher availability of canal irrigation. This is due to degraded soil and waterlogging that delays wheat sowing. The average productivity of wheat in the JBS pilot area is about 22 Q/ha. This is once again less than the state and national averages of 26 Q/ha for both crops. Nevertheless, where the resources are used conjunctively, all indicators of irrigated agriculture such as productivity, intensity, diversity of crops and soil health appear to be significantly better.

Current Land Use and Crop Intensity

To obtain the land use pattern over the area, IRS LISS III data of 2004-05 are used for three seasons Rabi, Kharif and Zaid. As expected, Remote Sensing analyses also demonstrate a similar overview of irrigated agriculture in the canal command. Diminished cropping intensity is clearly visible, especially along the branch and distributary canals in the head and middle reaches.



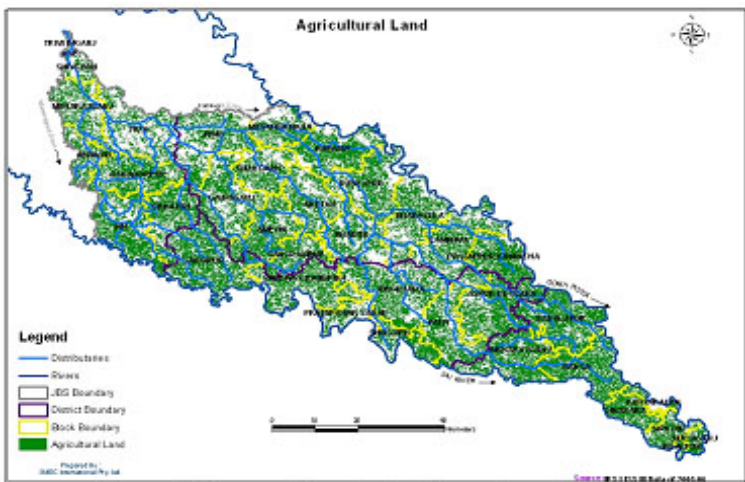
Soil salinity and sodicity in JBS canal command



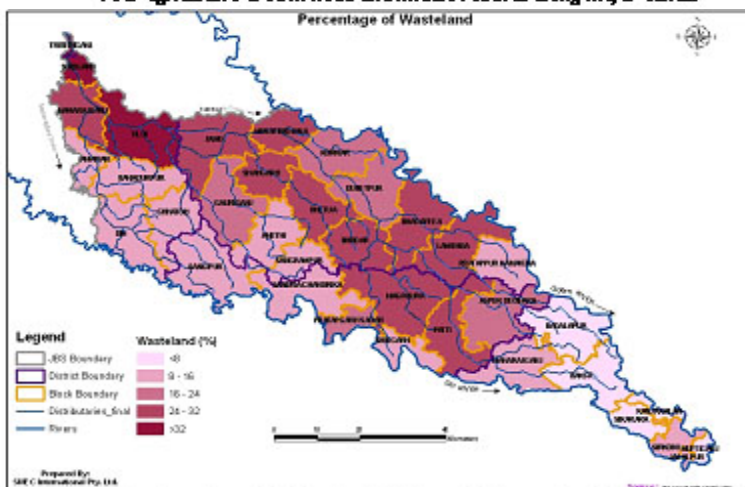
Settlement at risk in waterlogged areas of canal command



Orchards dying out in waterlogged area in canal command



Poor agriculture area in head and middle reaches along major canals



Distribution of wasteland as identified through Remote Sensing exercises

Most of the waterlogged areas and other wastelands extracted through Remote Sensing technique exhibit their accumulation around the major canals. Orchards in the waterlogged command area are on the verge of extinction; settlements are at risk due to capillary rise and consequent soil salinity and sodicity. Hence, limited options exist for crop intensification and diversification.



Better crops and orchards in case of conjunctive management

Lessons for Nepal from the Indian Experiences

Topographic and hydro-geologic conditions of the command areas of most canal systems in Nepal are a bit different compared to those of the Jaunpur Branch Sub-Basin. As compared to JBS, greater scope exists for surface and sub-surface drainages. Thus it may not be appropriate to generalize these observations to the Nepalese context. Nevertheless, arrangements of optimum drainage systems are usually expensive and consumptive. Under growing water scarcity scenarios and the possibility of affordable energy options in the future in Nepal, conjunctive irrigation management practice offers both increase in resources and prevention of ill-effects of continued canal irrigation. It is to be noted that such adverse agriculture scenarios have already been visible in the Nepalese context too, particularly in the Narayani and Chandra Nahar irrigation systems.

** Dr. Raut is a Senior Water Resource Engineer and Team Leader of Preparation of Ghaghra-Gomti Basin Plans and Development of Decision Support System, SMEC International, Australia.

FORTHCOMING EVENTS

National:

- National Seminar on “Partnership in Irrigation Sector in the Changing Context”, April 6, 2009. Department of Irrigation (DoI), Nepal on the occasion of “Irrigation Day 2065”. Main objective: to review the past achievements and to discuss on the present challenges and opportunities and identify how DoI can best contribute to the nation building process through poverty alleviation, promotion of inclusiveness and gender balance in irrigation development. Deadline for submission of full papers is March 30, 2009. Contact email: manandharpk@hotmail.com; phone #: 9841235920.

International:

- 5th World Water Forum, 15-22 March 2009. Istanbul, Turkey. (<http://www.worldwatercouncil.org/index.php?id=1842>)
- Transboundary Water Management Programme, March 23-April 3 2009, at Mozambique and 8-12 June 2009 at Sweden. Stockholm International Water Institute and Ramboll Natura. (<http://www.siwi.org/sa/node.asp?node=42>)
- Gender, Water and Equity, April 27 – May 1, 2009. Training Program organized by Tata Institute of Social Sciences (TISS), Mumbai, South Asian Consortium for Interdisciplinary Water Resources Studies (SaciWATERS), Hyderabad, Society for Promoting Participative

Ecosystem Management (SOPPECOM), Pune, and the Gender and Water Alliance (GWA). Mumbai, India. Contact email: gwetraining@gmail.com. (http://www.saciwaters.org/pdfs/GWET_2009.doc)

- The 10th China Water Show, 28-30 April 2009, Shanghai, China. Chinese Society for Environmental Sciences (CSES) and Shanghai ZM International Exhibition Co. Ltd., (<http://water.environmental-expert.com/resultEachEvent.aspx?cid=20634&codi=4111&idproducttype=3&idmainpage=0&level=0>)
- CIWEM Annual Conference 2009: Water and the Global Environment, 29-30 April, 2009. Olympia Conference Centre, London, UK. Chartered Institution of Water and Environmental Management (CIWEM) an independent professional body is organizing two day conference on multidisciplinary issues across all areas of the global water and environment sector. Contact email: Justin@ciwem.org (http://www.idswater.com/water/us/ciwem_annual_conference_2009/58/eventdetails.html)
- STRIVER Final Conference: Integrated Water Resource Management in Theory and Practice, 28-29 May 2009. Final conference to discuss the major finding of the EC-funded FP6 project STRIVER. Brussels, Belgium. Contact email: striver@niva.no (<http://kvina.niva.no/booking/tabid/59/Default.aspx>)

Mailing Address

Irrigation Management Division
P.O. Box 2055
